# DBCT 2019 DAU
# Review of the Economic Life of DBCT Assets

**A Confidential Report by Resource Management International**

**to the**

**Queensland Competition Authority**

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Resource Management International

# Executive Summary

### Introduction

The Queensland Competition Authority (QCA) commissioned Resource Management International (RMI) in December 2020 to independently assist with QCA's assessment of the economic life of the Dalrymple Bay Coal Terminal (DBCT) assets, as part of their assessment of the Dalrymple Bay Coal Terminal Management's (DBCTM) 2019 Draft Access Undertaking (DAU). The 2019 DAU is for a period of five years from the 1 July 2021 to 30 June 2026. The 2019 DAU has proposed to align asset life with the remaining length of DBCTM's initial lease period to September 2051, which is a period of 31 years from 2020. DBCT is owned by the Queensland Government, but leased to DBCTM. DBCTM would have an option to renew the lease for an additional 49 years from 2051.

DBCT and the adjacent BHP Mitsubishi Alliance (BMA) owned Hay Point Coal Terminal (HPCT) are supplied by coal from the central Bowen Basin area via the Goonyella Rail System. DBCT currently has a name plate capacity of 85 million tonnes per annum (Mtpa), while HPCT has a name capacity of 55Mtpa. DBCTM has well advanced plans to increase capacity at DBCT to 97.5Mtpa ('8X' expansion) by mid-2027. Only minor upgrades to the Goonyella Rail System are required for this expansion. A further '9X' expansion to 135.7Mtpa is being assessed by DBCTM, which would require significant upgrading of the Goonyella Rail System, but no timing has yet been set. We have excluded this expansion from our consideration of coal supply life to the DBCT facility. HPCT capacity is assumed to remain at 55Mtpa.

### Coal Market Assessment

The Global Economy is recovering from the depths of the April 2020 lockdowns due to the Covid 19 pandemic. Sharp declines in growth were experienced in the UK, India, Europe, Brazil and to a lesser extent the USA. Direct and indirect impacts have resulted in reduced demand for Australian thermal and metallurgical coal in 2020, record low coal pricing and impacts on short term mine developments and expansions.

The January 2021 World Economic Outlook Update (WEO) (IMF, 2020a) estimated negative global growth of -3.5% in 2020. The WEO is forecasting increased growth to about 3.5% per annum from 2021 to 2025, which is a more modest and delayed growth expectation than projected before the COVID-19 pandemic. Due to an improving economic rebound in the second half of 2020 it is now anticipated that global growth will return to pre Covid-19 levels by 2022, and in some economies like China in a V-shaped recovery by 2021. Medium term growth is projected to recover more rapidly by 2025 in emerging market and developing economies, including China, India, South East Asia, Pakistan and Bangladesh that are key markets for Australian coal suppliers.

RMI has assessed the potential negative impact on thermal and metallurgical coal demand of zero-carbon emission targets. While there are several approaches to achieving zero-carbon emissions, increased renewable energy production and new technologies for steel production are likely to have an increasing impact on thermal and metallurgical coal demand in the long-term. Any impact on metallurgical coal demand is likely to occur much later than for thermal coal, due to alternate steel manufacturing technologies being much less advanced. We expect the move to increasing decarbonisation and reduced coal demand will be mitigated by:

- Strong demand from South East Asia, China and India for coal fired power, with a large number of new coal-fired power stations under construction or approved for construction in the next 10 years;
- Carbon Capture and Storage;
- Continued construction of coal dependent blast furnaces in South East Asia and India, and the early stage and commercially unproven nature of alternate steel production technologies.

RMI concludes that, despite zero carbon emission targets, seaborne thermal and metallurgical coal demand into South East Asia, India, Pakistan and Bangladesh is likely to continue to grow for at least the next 10 years, peaking around 2035. Demand from China, with a population of more than 1.4 billion, is expected to remain stable, but may increase as it more rapidly depletes its resources of least cost, better quality coals. The other highly populated areas are South East Asia, at just over 1 billion people and India at 1.4 billion people, and both areas with growing middle-income sectors with an equally growing energy demand per capita.

As most existing coal-based power generation and steelmaking infrastructure will have an operating life in excess of 40 years, we expect that the demand growth for thermal and metallurgical coal may start to flatten from 2035, and then gradually decline from 2060 as existing infrastructure is retired and possibly replaced by more carbon neutral technologies.

Metallurgical coal DBCT throughput is currently in excess of 80%, reflecting the nature of coal types within the Goonyella Rail System corridor. RMI considers that DBCT will remain a predominantly metallurgical coal export facility. This report will therefore focus mostly on metallurgical supply and demand, but it is also expected that thermal coal demand will remain strong in the medium to long term and support the thermal coal users through DBCT. Demand for seaborne metallurgical coal from India, emerging South East Asian countries and China is expected to remain strong for at least the next 10 years (Table below), with an expected increase in coal demand of about 100 Mt (10Mtpa average) from 2020 to 2030. Conventional coal-based blast furnaces are still being constructed to meet growth in crude steel demand, and the 30-40 year life of this infrastructure will likely sustain metallurgical coal demand until at least 2060.

| **Seaborne Metallurgical Coal Imports (Mt)** | **2019** | **2020e** | **2021f** | **2022f** | **2023f** | **2024f** | **2025f** | **2030f** |
|---|---|---|---|---|---|---|---|---|
| **Japan** | 66 | 62 | 62 | 65 | 67 | 67 | 64 | 62 |
| **India** | 72 | 56 | 65 | 73 | 78 | 83 | 88 | 104 |
| **China** | 42 | 47 | 47 | 50 | 55 | 60 | 65 | 65 |
| **Korea** | 35 | 30 | 32 | 35 | 35 | 35 | 35 | 30 |
| **Brazil** | 16 | 12 | 14 | 18 | 18 | 20 | 20 | 22 |
| **Europe** | 48 | 42 | 44 | 51 | 54 | 52 | 50 | 46 |
| **Vietnam** | 5 | 6 | 8 | 12 | 15 | 18 | 20 | 25 |
| **Other** | 38 | 33 | 35 | 40 | 40 | 38 | 35 | 32 |
| **World** | **322** | **288** | **307** | **344** | **362** | **373** | **377** | **386** |

Source: IEA, (Platts, 2021a), RMI.

There is limited metallurgical coal supply capacity outside of the Bowen Basin that can compete with Bowen Basin coals in terms of product quality and cost of supply. RMI concludes that the Bowen Basin, and in particular the Goonyella Rail System corridor, is in a very strong competitive position to maintain a dominant metallurgical coal market share in the medium to long term.

**Assessment Methodology**

The current assessment is based on a database of information for all operating mines and significant mining projects within the Goonyella Rail System corridor, which includes information on development status, mining methods, production rates and reported Coal Reserves and Resources. We have adjusted Reserve and Resource estimates to a common December 2020 basis, with Measured & Indicated Resources determined exclusive (additional to) Reserves. Inferred Resources are recorded, but not included in the supply life analysis.

There is a long list of potential projects within the Goonyella Rail System corridor, which are at various stages of project feasibility assessment and development. All known projects have been ranked in terms of their development prospectivity, based on the availability of existing infrastructure (i.e., Brownfield or Greenfield) and current stage of development (Rank 1, 2 or 3). Rank B1 and G1 projects have at least pre-feasibility studies completed and Reserves defined, while B2 and G2 projects have at least a conceptual mine plan and significant Measured and Indicated Resources. B3 and G3 projects are early exploration stage and have not been used in the supply life analysis.

Estimates of **Indicative Saleable Product** have been determined for all operating mines and coal projects within the Goonyella Rail System corridor, based on December 2020 Marketable Reserves plus the saleable portion of Measured & Indicated Resources. The latter takes account of mine or project specific estimates of mining recovery and coal processing yield.

RMI used two methodologies in our review for the DBCTM 2015 DAU, of which Method 1 involved a simple division of total **Indicative Saleable Product** being delivered to DBCT, for all operating mines and Rank 1 & 2 projects, by DBCT capacity. This method is now complicated by the expansion of DBCT capacity during the forecast period. Method 2, which involved annualised scheduling of operating mine and Rank 1 & 2 projects, is now preferred. It provides a supply life estimate, and the point at which coal supply may start to decline below an economically viable DBCT throughput level.

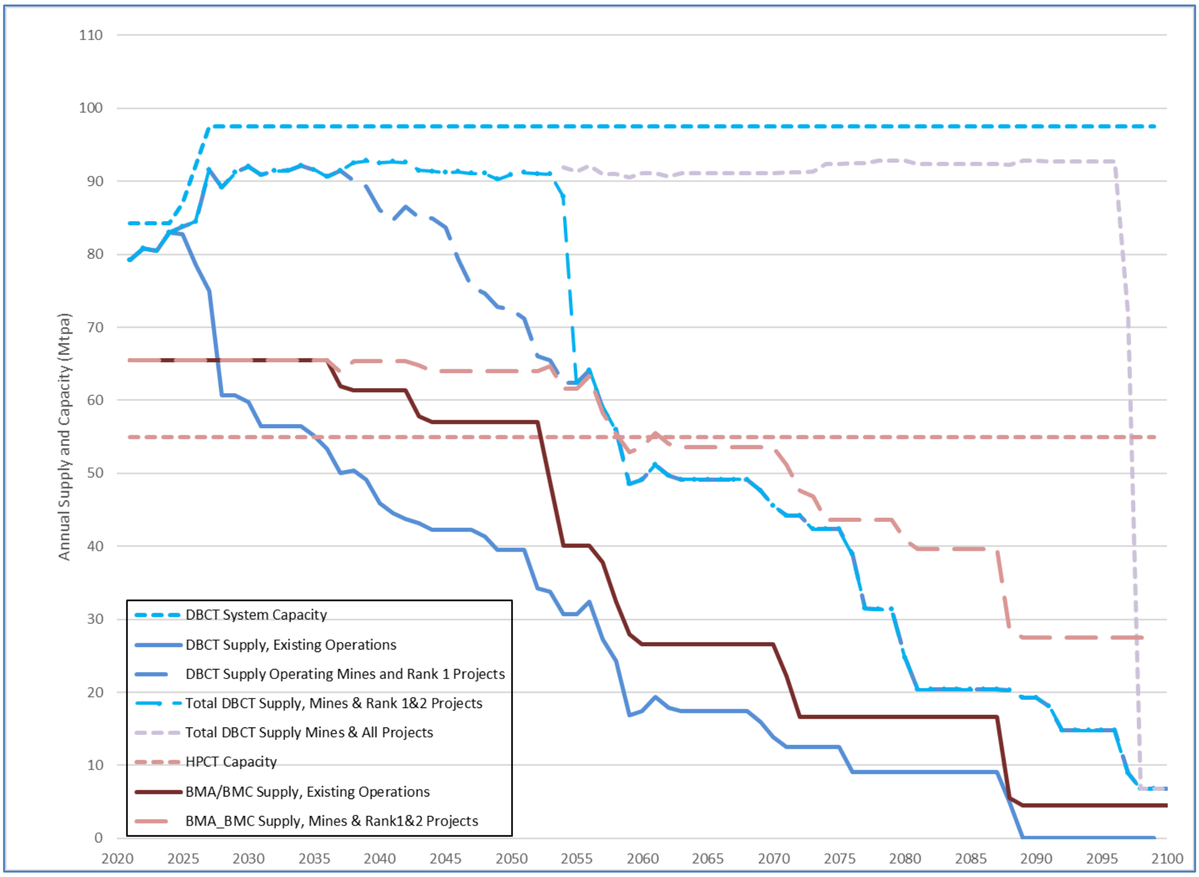
**DBCT Coal Supply Life Forecast**

Total estimated Indicative Saleable Product for operating mines and advanced (B1, G1, B2 and G2) projects is about [redacted] Mt. About 4,705 Mt of this is BMA and BHP Mitsui Coal (BMC) supply, of which we estimate 8 - 13 Mtpa is currently being delivered to DBCT. Indicative Saleable Product supply to DBCT will be sustained or decline, depending on the timing of mine closures, availability of new projects, port capacity and market demand for coal types within the Goonyella Rail System corridor. The positive outlook for metallurgical coal demand to at least 2060, suggests that there will be a steady stream of new projects being developed to replace mine closures within at least that period.

The graph below presents our estimation of coal supply life to DBCT and HPCT using the Method 2 analysis. RMI concludes that there is likely to be sufficient saleable product supply from operating mines and Rank 1 & 2 projects within the Goonyella Rail System corridor, including BMA/BMC supply that is surplus to HPCT capacity, to sustain DBCT at near capacity until at least 2053. Other observations include:

- Supply from existing operations supplying coal to DBCT starts to decline during the period from 2025 – 2027, but DBCT supply and the proposed increase in DBCT capacity to 97.5 Mtpa over that period, will be supported by market demand and new projects;
- Supply from existing BMA/BMC mines and advanced projects declines to just below the capacity of HPCT (55Mtpa) at about 2058, assuming current production rates, but remains at close to HPCT capacity until about 2070.

**Coal Supply to DBCT and HPCT Export Terminals**




We note that the estimates do not consider the Inferred resources of operating mines and rank 1 and 2 projects, which together provide significant upside coal supply potential to DBCT. RMI concludes that the supply life estimates are therefore conservative. Upside supply potential from Rank 3 projects alone could conceivably sustain DBCT supply until beyond 2090, although there is currently a low level of resource and coal market certainty associated with this estimate.

There has been an increase in the estimates of Indicative Saleable Product for operating mines and rank 1 & 2 advanced projects from the 2015 DAU review, despite about 650Mt having been mined from within the Goonyella Rail System corridor over this time. This is due to two factors:

- operating mines continually defining new Reserves and Resources ahead of mining for mine planning purposes as the mines advance;
- Coal exploration expenditure was high during the period from late 2016 to 2019, due to significantly higher coal prices, resulting in increased Measured & Indicated Resources for at least operating mines. By comparison, there was a sustained period of low coal prices and reduced exploration expenditure in the 5 years prior to the 2015 DAU review.

RMI concludes that a component of the Indicative Saleable Product estimate for operating mines is likely to remain constant, while resource potential exists ahead of mining, due to mines constantly refreshing Reserves estimation. However, the quantity of additional Measured & Indicated Resources may vary cyclically as exploration expenditure varies with coal price and the prevailing market sentiment. Project Reserves and Resources are also likely to vary cyclically, while undefined resource potential remains within the Goonyella Rail System corridor.

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# Introduction

The Queensland Competition Authority (QCA) is an independent statutory body responsible for assisting with implementing competition policy in Queensland. In particular, the QCA is responsible for the economic regulation of key rail, port and water monopoly infrastructure services, including the Dalrymple Bay Coal Terminal (DBCT). DBCT is a common-user coal export terminal servicing mines in the Goonyella system of the Bowen Basin coal fields. It is owned by the Queensland Government, but leased to Dalrymple Bay Coal Terminal Management (DBCTM) for 50 years commencing 15 September 2001 to 15 September 2051. DBCTM would then have an option to extend the lease for an additional 49 years.

DBCT is 'declared' a monopoly business activity under the Third-Party Access Regime (Part 5) in the QCA Act. While Part 5 of the Act imposes broad obligations on the access provider, it also provides for QCA to assess and approve access undertakings provided by DBCTM.

An access undertaking sets out non-price and price-related terms and conditions for the negotiation of access agreements with mine owners utilising DBCT facilities. The access undertaking provides a framework for third parties to negotiate access to the coal export terminal managed by DBCTM.

DBCTM submitted a draft access undertaking (DBCT 2019 DAU) to apply from 1 July 2021 for a period of five years. The QCA is currently assessing the 2019 DAU, in accordance with its statutory obligations under the QCA Act, including consideration of the economic life of the DBCT terminal assets for the purposes of estimating depreciation and remediation allowances.

The Queensland Competition Authority (QCA) commissioned Resource Management International (RMI) in December 2020 to independently assist with QCA's assessment of the economic life of the DBCT assets. A final consultancy Terms of Reference (TOR) was provided on 10 December 2020, which states that the consultant is required to undertake an independent assessment of the economic life of the DBCT assets. The methodologies to be used should be based as much as possible on the methodologies used in RMI's previous assessment of DBCTM's 2015 DAU, while taking account of changes in the coal supply and demand environment within the DBCT catchment area.

Methodologies used in RMI's assessment are detailed in the relevant section, but have been based on an assessment of:

- Coal market environment;
- DBCT throughput capacity;
- Coal supply potential and longevity of operating mines that utilise the DBCT and BMA's Hay Point Coal Terminal (HPCT), in relation to the demand for metallurgical and thermal coal;
- Coal supply potential and longevity of coal mining projects;
- A conceptual coal supply annualised schedule to determine when the supply of coal from the DBCT catchment area may start to decline.

## Scope of Work

The agreed scope of work is as follows:

- Review the Central Queensland coal transport and supply network, as relevant to determining the life of DBCT assets;
- General review of the metallurgical and thermal coal market, including:

    - future supply and demand prospects;
    - Potential timing of new technology developments that may impact demand for both product types;
    - Review the proportion of metallurgical and thermal coal supply from the DBCT catchment area;
    - cost competitiveness of Bowen Basin suppliers utilising DBCT.
- Compile relevant data from mines and projects that utilise or may utilise the DBCT and HPCT export terminals, including:
    - map and compile resource data for mines and projects, including up to date JORC Resources and Reserves;
    - Assess relevant mining conditions, likely mining methods, historical production and production rates over the life of each mine or project;
    - assess projects in terms of stage of development, likely start up time, and mine life;
    - Collate Reserve and Resource estimates and adjust to December, 2020;
- Review the quoted capacity of the DBCT terminal, and any changes in capacity that may be expected over the period of likely coal supply;
- Assess mine and project coal supply life to DBCT and HPCT;
- Schedule estimated life-of-mine (LOM) annual production from operating mines and advanced projects, over the projected period of coal supply availability;
- Prepare a draft and final report to the QCA, detailing assessment methodology, assumptions and conclusions.

## Information Provided by QCA

Information sourced from the QCA included information published on QCA's web-site www.qca.org.au, which has been referred to where relevant and includes:

- DBCT Management's 2019 DAU, and associated documents;
- Stakeholder submissions to the 2019 DAU;
- QCA's Interim Draft Decision dated February 2020, and
- QCA's subsequent Draft Decision dated August 2020

Confidential documents provided by QCA include:

- DBCT Management submission on the QCA's Interim Draft Decision, dated April 2020, which include an unredacted DBCT User contract profiles as Appendix 1; and
- DBCT Management DBCT 2021 Access Undertaking; DBCTM Collaborative Submission dated 5 June 2020, which included a Contract Profile update as Appendix 2.

RMI independently accessed other information, including:

- Dalrymple Bay Infrastructure (DBI) Prospectus, dated December 2020, which included details of expansion plans and an AME coal market review;
- DBCT Master Plan 2019 – Expansion Opportunities at the Dalrymple Bay Coal Terminal.

## Relevant Coal Supply Infrastructure

### Goonyella Rail System

The DBCT and HPCT catchment area is essentially defined by Aurizon Network's Goonyella Rail System (GRS), which provides the shortest rail link to the Dalrymple Bay (DBCT) or Hay Point (HPCT) coal export terminals for Bowen Basin operations from North Goonyella and Hail Creek in the north, Blair Athol in the west and Oaky Creek in the south (Figure 1 and Figure 2). lists operational mines within the Goonyella Rail System corridor.

The Goonyella Rail System is connected to the Blackwater System in the south, and the Goonyella-Abbot Point Rail System in the north. The Blackwater Rail System therefore provides a potential rail link option to the RG Tanner and WICET coal export terminals near Gladstone, particularly for mines and projects at the southern end of the DBCT catchment area as indicated in Table 5. Similarly, the Goonyella-Abbot Point Rail System provides a potential rail link option to the Abbot Point coal terminal in the north, particularly for mines and projects at the northern end of the DBCT catchment area. Conceivably, DBCT also provides a coal export terminal option for mines and projects to the north and south of the traditional DBCT catchment area. However, rail distance is a major cost consideration for mines and projects in applying for port access allocations.

Capacity on Aurizon's Goonyella Rail System was increased from 129 Mtpa to 140 Mtpa during the period from 2013 to mid-2015, as part of the Goonyella Rail Expansion Project. Aurizon Network is currently reviewing capacity of the Central Queensland Coal Network, which includes the Goonyella system, with an independent expert report expected to be released in the second half of 2021 (Aurizon, 2020). Potential Goonyella Rail System expansion plans are discussed below in relation to proposed DBCT expansions (DBI, 2020).

### Dalrymple Bay Coal Terminal

The Dalrymple Bay Coal Terminal (DBCT) is located at Hay Point, 38 km south of Mackay on Queensland's east coast (Figure 1). DBCT is owned by the Queensland Government and currently leased to Dalrymple Bay Infrastructure Management (DBIM) and the Dalrymple Bay Trust (DBT). DBCT is located adjacent to the Hay Point Coal Terminal (HPCT), which is owned and operated by BHP Mitsubishi Alliance (BMA), as described below. The Hay Point ports combine to form the largest of four coal export port terminals servicing Queensland.

A restructure has been proposed, under which a new entity Dalrymple Bay Infrastructure (DBI) will be superimposed as the holding company of the DBCT entities DBIM and the DBT. DBI is an Australian infrastructure company, which is jointly owned by investors and managed by Brookfield Infrastructure Partners (DBI, 2020).

The current 50-year lease period, which commenced September 2001, will expire in September 2051. DBI would have the option to extend the lease for another 49 years to September 2100, which may only be exercised within a two-year period from September 2045 (DBI, 2020). The DBCT is declared for third party access under the Queensland Competition Authority Act, with terms and conditions of access regulated by a QCA approved access undertaking.

Figure 1: Queensland Coal Transport Infrastructure

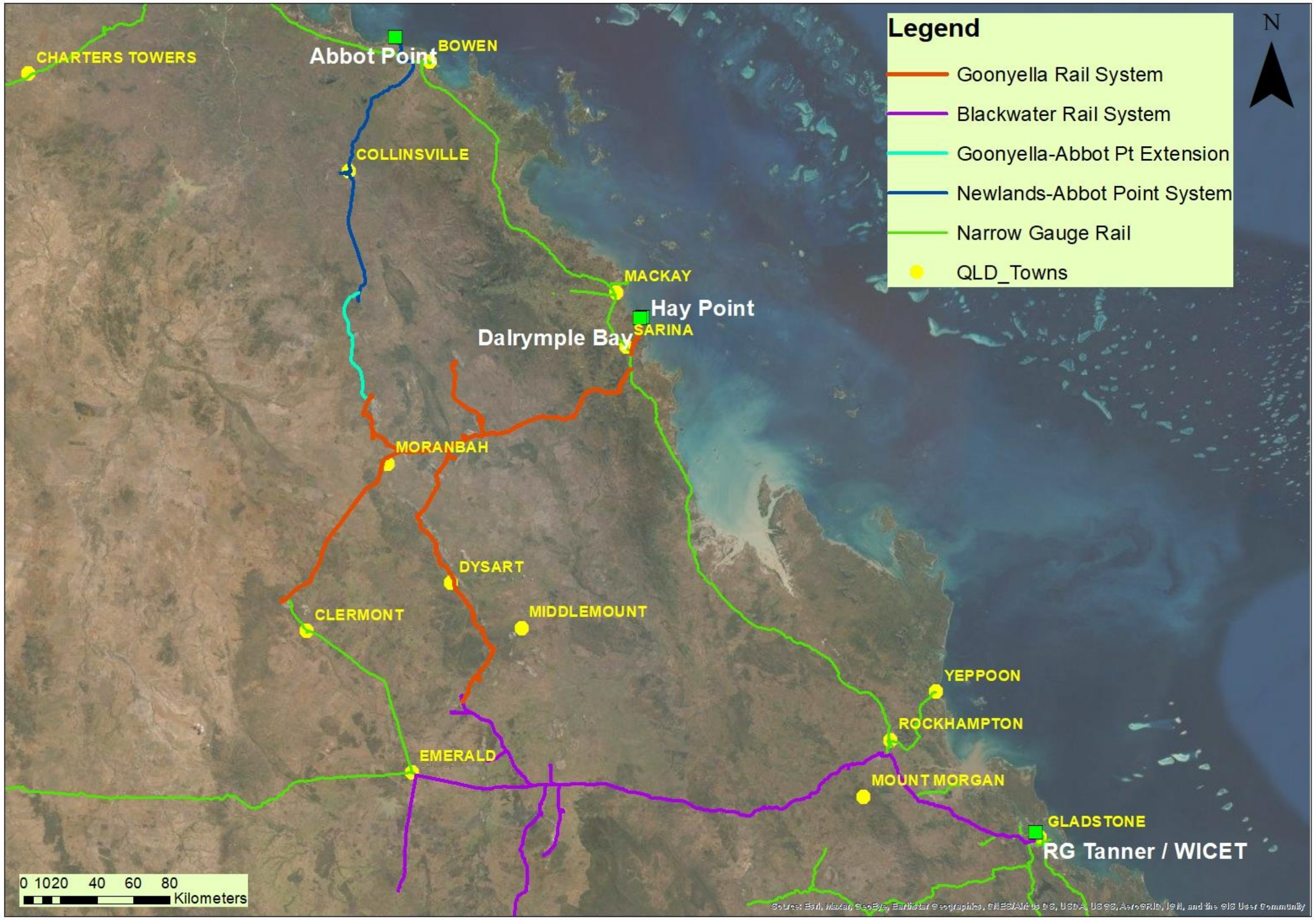
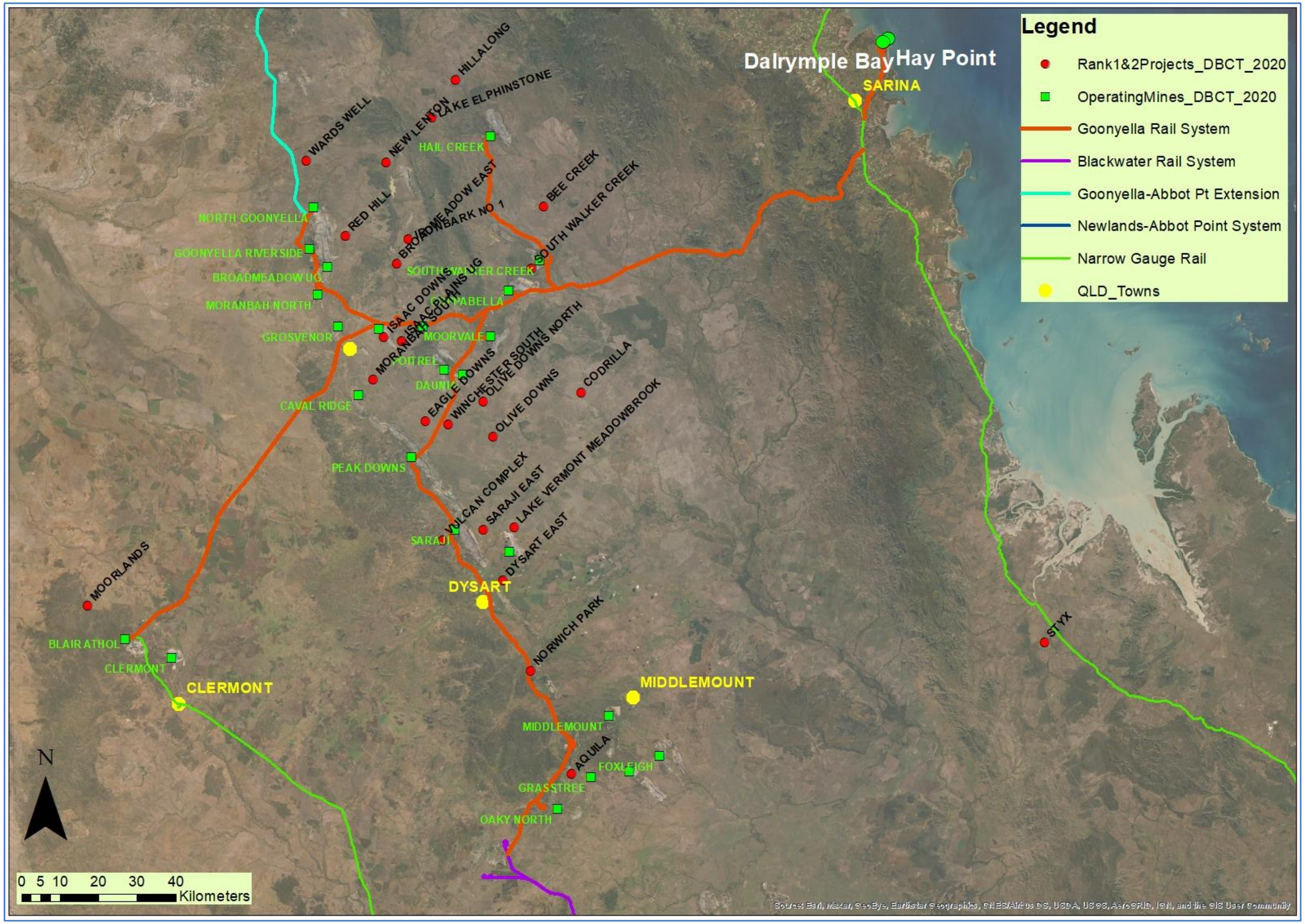


**Figure 2: DBCT and HPCT Catchment Areas**



DBCT handles mostly metallurgical coal exports, reflecting the nature of coal resources within it's catchment area. Approximately 80% of coal shipped through DBCT in 2019 was metallurgical coal. All DBCT throughput is contracted under Access Agreements with individual users. DBI (DBCTM) notes in its 2020 Prospectus that DBCT is likely to remain the terminal of choice for the central Bowen Basin area, given it's leading role in supplying high quality metallurgical coal and the positive outlook for metallurgical coal demand (DBI, 2020).

DBCT has four coal loading berths and three ship loaders (DBCTM website, n.d.). The DBCT has been progressively expanding its system capacity in conjunction with Aurizon Network, with a major expansion to a Name Plate capacity of 85Mtpa in 2009. Although DBCT has a theoretical stand-alone Terminal Capacity of 94Mtpa (DBCTM, 2019), long-term constraints resulting from the constraining effects and interface inefficiencies with the upstream supply chain, mean that DBCT has a System Capacity of 84.2Mtpa (Name Plate Capacity 85Mtpa). DBCTM may only currently contract coal throughput up to the System Capacity (DBCTM, 2019).

Utilisation (actual throughput) increased progressively to about 80% in FY2014, and has ranged from 72 – 85% from FY2014 to FY2019, averaging about 81% (Table 1). DBCTM report that various factors have combined to limit throughput during this period, including System Capacity constraints, below target user production and impact of significant weather events (DBCTM, 2019). User production has been consistently below take-or-pay contracted tonnages, particularly during the period from 2008 – 2020 when contracted capacity increased to 84.2Mtpa. Actual throughput ranged from 44 – 62Mtpa from 2008 – 2013, and then increased to 63 – 71Mtpa from 2014 – 2019, due to higher coal prices. Throughput dropped to 61.85Mtpa (72.8% utilisation) in FY2020 due to largely Covid-19 related reductions in coal export demand.

**Table 1: Historical DBCT and HPCT Throughput and Capacity**

| Year (YEJ) | DBCT | | | HPCT | | | Total | |
|---|---|---|---|---|---|---|---|---|
| | Loaded | Capacity | Utilisation | Loaded | Capacity | Utilisation | Loaded | Utilisation |
| 2020 | 61.854 | 85 | 72.8% | 49.685 | 55 | 90.3% | 112 | 79.7% |
| 2019 | 69.549 | 85 | 81.8% | 48.93 | 55 | 89.0% | 118 | 84.6% |
| 2018 | 70.943 | 85 | 83.5% | 49.61 | 55 | 90.2% | 121 | 86.1% |
| 2017 | 63.478 | 85 | 74.7% | 43.43 | 55 | 79.0% | 107 | 76.4% |
| 2016 | 67.708 | 85 | 79.7% | 48.25 | 55 | 87.7% | 116 | 82.8% |
| 2015 | 71.878 | 85 | 84.6% | 43.42 | 55 | 78.9% | 115 | 82.4% |
| 2014 | 67.85 | 85 | 79.8% | 40.84 | 44 | 92.8% | 109 | 84.3% |
| 2013 | 62.441 | 85 | 73.5% | 34.34 | 44 | 78.0% | 97 | 75.0% |
| 2012 | 51.47 | 85 | 60.6% | 32.04 | 44 | 72.8% | 84 | 64.7% |
| 2011 | 54.88 | 85 | 64.6% | | | | | |
| 2010 | 63.7 | 85 | 74.9% | | | 85.9% | | |
| | | | | | | | | |

Sources include DBCTM annual reports, HPCT website (http://www.nqbp.com.au/hay-point/) and (ABS, 2021)

DBCTM has expansion plans that would increase DBCT throughput capacity by about 13.3Mtpa to 97.5Mtpa (8X Expansion), and subsequently by about 38Mtpa to 135.7Mtpa (9X expansion) (DBI, 2020). DBI reports that only minor rail upgrades at DBCT are required for the 8X expansion, while capacity on the Goonyella Rail System would need to be significantly expanded to accommodate the

9X Expansion. The latter would include increased capacity on the trunk route between Hatfield and Yukan.

The 8X expansion process comprises four phases, of which Phases 1 – 3 will provide an additional 10.5Mtpa of additional capacity by December 2025 (to 87Mtpa system capacity), and Phase 4 an additional 2.8Mtpa to 97.5Mtpa system capacity by June 2027 (DBCTM, 2020b). Studies for Phase 4 have been completed, and all studies required for an investment decision are expected to have been completed by June 2022, after which Phase 1 – 4 construction works will begin (DBI, 2020).

DBIM conducted a survey of existing and potential users in early 2020 to determine DBCT capacity and expansion requirements going forward (DBI, 2020). DBI requested Users to exercise their extension options, if required. Our understanding of information presented in the DBI Prospectus (i.e. Fig 4.10), is that contracted throughput increases from 79.1Mtpa in June 2020, 81.9Mtpa in 2021, 82.8Mtpa in 2022, and 84.2 from 2023 to June 2028, with the longest contract extending to June 2033 (DBI, 2020). Contracted Users currently include 17 operating mines and 2 near term projects.

In addition, Conditional Access Agreements (CAA) and Standard Underwriting Agreements (SUA) have been finalised, which would progressively increase contracted DBCT throughput by 14.87Mtpa (to 99.07Mtpa) , which is 1.57Mtpa above the new 8X expansion capacity of 97.5Mtpa. Furthermore, as of June 2020, three subsequent access applications have added 9Mtpa of additional unmet capacity to the DBCT Access Queue. This would take total contracted throughput to about 108Mtpa (DBCTM, 2020c), which is around 10Mtpa above the 8X expanded capacity, but within the yet to be scheduled 9X expansion.

We have assumed the above timing of Access Agreements and capacity expansion in our assessment of the timing of new supply from the DBCT catchment area. We have not assumed a timing for the 9X expansion, nor included it in our assessment of coal supply life from the Goonyella Rail System.

### Hay Point Coal Terminal

HPCT is owned and operated by BHP Mitsubishi Alliance (BMA), and used solely for coal exports from BHP controlled mines on the Goonyella Rail Network (Figure 1). BMA increased capacity at HPCT during calendar year 2015 from 44 to 55 Mtpa. Utilisation of the HPCT facility since 2015 has ranged from 79% to 90%, averaging 87%.

Projected saleable coal supply from BMA/BMC mines on the GRS is estimated to be about 65.5Mtpa currently, of which most is delivered to HPCT. RMI understands that BMC production from Poitrel and South Walker Creek mines, which currently comprises about 10Mtpa, is mostly supplied to DBCT under Access Agreements. This leaves 55.5Mtpa for delivery to HPCT, which has a name plate capacity of 55Mtpa. RMI estimates that from 3 – 10Mtpa of BMA coal may be available for supply to DBCT, in addition to 10Mtpa from BMC mines, depending on utilisation performance at HPCT. RMI understands that BMA has only a small Access allocation at DBCT, but also Access allocations at APCT and the RG Tanner terminal near Gladstone. BMA is also likely to participate in the on-going bartering of spare DBCT Access allocations between mines. RMI is unaware of any future plans to increase capacity at the HPCT from its current capacity of 55Mtpa.

# Review of Coal Market

## Global Economy

The Global Economy is slowly recovering from the depths of the April 2020 lockdowns due to the Covid 19 pandemic. Not all countries are experiencing the same degree of recovery and several have been forced into further lockdowns, including the United Kingdom, parts of Europe and India. China is the only country that has fared better than most with a more rapid “V-curve” recovery, but a return to pre-pandemic 2019 levels of growth is proving difficult for most other countries.

Sharp declines in growth were experienced in the UK, India, Europe, Brazil and to a lesser extent the USA. Direct impacts have resulted from falling energy demand due to internal country lockdowns, mass hospitalisations and deaths, major impacts on transport and manufacturing. Indirect impacts for countries experiencing secondary declines, like India’s loss of manufacturing and energy imports directly affected demand for Australian coal in 2020. Similar issues have impacted global oil demand with dramatic short-term lock downs reducing transport and vehicle movements in most countries. The fall in demand has also led to large falls in energy commodity pricing for oil and coal with pricing at record lows, which in turn has had an impact on short term new mine developments and expansions.

Due to an improving economic rebound in the second half of 2020 it is now anticipated that global growth will return to pre Covid levels by 2022 and in some economies like China in a V-shaped recovery by 2021. The January 2021 World Economic Outlook Update (IMF, 2020a), which is produced by the International Monetary Fund (IMF), has estimated negative global growth of -3.5% in 2020, rising to +5.2% in 2021.

After the rebound in 2021, the WEO forecasts medium term growth, from 2021 to 2025, will increase to about 3.5% per annum. This implies that both advanced and emerging market and developing economies will more modestly progress toward the 2020–25 path of economic activity projected before the COVID-19 pandemic. The advanced economy group is expected to recover slowly over the medium term. Among emerging market and developing economies, growth is projected to recover more rapidly by 2025, this group would include China, India, South East Asia, Pakistan and Bangladesh, which are key markets for Australian coal suppliers.

China, despite experiencing a major lockdown in March and April, has rapidly rebounded in the second half of 2020. Growth in China is forecast to fall to 1.9% for 2020 and recover to 8.2% for 2021 which compares favourably to 6.1% for 2019, (IMF, 2020a).

All countries have now implemented major stimulus packages to support medium term growth. However, the success of these stimulus programs will be affected by the major increases in sovereign debt, continuation of social distancing and mask initiatives, speed of vaccine coverage, adjustment costs and productivity impacts on surviving companies, amplifications of shocks from firm bankruptcies, and financial market sentiment and its implications of global market capital flows (IMF, 2020a).

Therefore, despite the severe impact of Covid 19, the world appears to be on track to full recovery by 2022, followed by modest growth to 2025. A key driver is China’s stability, but also ongoing growth in India, South East Asia, Pakistan and Bangladesh, which are critical for Australian seaborne coal exports demand.

## Zero carbon Emissions by 2050

A potential negative impact for Australian coal exporters is that most developed countries are now targeting zero carbon emissions by 2050. These include signatories to the Paris Accord including Europe, USA, Japan, and South Korea. China has a target of zero carbon by 2060. RMI considers that this will impact India and South East Asia to a lesser extent, because they are not Paris Accord signatories and have developing economies with high forecast infrastructure and energy demand. The program of de-carbonisation has accelerated since the DBCT 2017 Access Undertaking and is an increasing consideration in regard to long term demand for both thermal and metallurgical coal demand. It is expected that many countries will have a multi-faceted approach to achieving zero carbon including:

- Striving for energy efficiency and new technologies in manufacturing and steel production;
- Increasing percentage of renewables for energy production including wind, solar, hydro and geothermal;
- Pursuing carbon capture and storage;
- Looking to move to alternate clean energies including hydrogen and ammonia for steel production and transport.

This is now expected to have a negative impact on coal exports over the longer term, but at this stage the impact cannot be fully quantified in regard to coal exports from Australia or specifically DBCT. The move to increasing decarbonisation will be mitigated by:

- Strong and ongoing demand from South East Asia, China and India for coal fired power with a larger number of new coal fired, High Efficiency Low Emissions (HELE) power stations currently under construction or approved for construction within the next 10 years. These are expected to have a life of at least 30 years;
- The ability to mitigate some coal fired emissions with development of Carbon Capture and Storage;
- The current lack of proven commercial, at scale hydrogen and alternate crude steel production capability, and also with ongoing construction of Basic Oxygen Blast Furnaces (BOF) in South East Asia and India.

However, on balance it is expected that both thermal coal and metallurgical coal demand, for Australian coal, will remain strong due to growing demand in the developing economies of India, South East Asia, Pakistan, Bangladesh. RMI considers that population growth continues to be the challenge for decarbonising economies. There is in excess of 2.4 billion people in these economies, with a majority moving from low income to middle income demand, while existing demand from China, with an increasingly affluent population of more than 1.4 billion, is likely to remain stable.

Historically, it has been seen that a move away from coal usually starts in the high-income nations and takes decades to complete. It was seen in the United Kingdom and other European countries that it can take more than 40 years to move from peak coal consumption to near zero consumption, due mostly to the difficulty to replace base load demand, and the 35-40 year life span of coal fired power stations. The situation is even more difficult for crude steel production as although there are now some new and innovative options, including hydrogen, there is no commercial large-scale replacement for the basic oxygen blast furnace for at least another 10 years and then only at limited capacities. During this time there is a forecast strong growth in basic oxygen blast furnace construction in South East Asia and India, and these plants also have operating lives of more than 30 years.

Several R&D efforts are under way, including the following initiatives that are working towards near-zero-carbon-emissions crude steel production (IEA, 2020a):

- The Hydrogen Breakthrough Ironmaking Technology (HYBRIT) project in Sweden, which is developing hydrogen-based Direct Reduction Iron (DRI) production. This project is currently aiming to produce the first fossil-carbon-free steel for sale in 2026, a considerable advancement from the previous target of 2035. Additional time would likely be required after that for scaled-up production and then full commercialisation. Construction of a pilot plant was completed in September 2020 (Renew Economy, 2020). As part of a separate initiative, a pilot plant using hydrogen reduction is also being designed in Germany, to be built by 2030.
- The 'HISarna' project is testing an enhanced smelt-reduction technology that could be combined with Carbon Capture and Storage (CCS). A pilot plant in the Netherlands has produced 60 kt of iron, and plans are under way for a second large-scale pilot plant (0.5 Mt) in India, which could open in 2025-30.
- Japan's 'COURSE 50' project to develop a lower-emissions steel production process, is based on the traditional blast furnace technology, but includes several carbon emissions reduction features such as: gas recovery from the blast furnace to reduce fuel input needs, reform coke oven gas into hydrogen to be used as fuel, and integrate carbon capture. The first phase of testing in an experimental blast furnace was completed in 2017, and the programme is aiming for a commercial scale demonstration by 2030. Similar technology is being tested by the 'IGAR' and '3D' projects at an ArcelorMittal plant in France, which involves using DRI technology in the blast furnace shaft with plasma injection technology as a reducing gas.
- The 'Siderwin' Project, which is developing steel production via low-temperature electrolysis, known as electrowinning. An engineering-scale pilot was expected to be commissioned in 2020, but work is on-going.
- Boston Metal's work on high-temperature electrolysis, with a prototype cell commissioned in 2014 and plans to test full-scale cells by 2024.

Continued efforts on these and other innovative projects will be integral to bring these technologies to full commercialisation in the coming decade.

Total coal consumption has already peaked in developed economies like the USA and Europe, with replacement lower carbon intensity energy like natural gas and renewables. Notably the UK has now already achieved coal free production from a peak consumption in the 1970's, but it has taken more than 45 years to achieve this goal. There are less than 3 coal mines now in production, and these are coking coal producers for the remaining UK steel mills. A similar situation has occurred in Germany with closure of all black coal mines and the final closure of the lower quality lignite mines expected within the next 10 years. Poland is now the main coal producer within Europe, while most coal demand is now supplied from Russia and the USA for remaining European steel mills and power stations.

Countries that have not seen a per capita total coal consumption peak include China, India, and Indonesia, which now account for the lion's share of global coal consumption. Pakistan, Myanmar and Bangladesh also have major coal fired power station and infrastructure construction programs. The USA is still a large consumer at over 600 Mtpa of thermal and metallurgical coal per annum, but it has already reached its peak and is now in decline with gas and renewables taking a larger share in energy production. Most USA thermal and metallurgical coal production is for domestic consumption with exports now less than 60 Mtpa, servicing mostly, Japan, India, Europe and some South American countries.

Further significant reductions in prices of low-carbon energy production alternatives, such as solar and wind, will help to expedite the move to zero carbon, but to avoid the intermittency problem associated with renewables, natural gas (the closest substitute for coal) is needed. New battery technology will also assist, but currently there is not technical capability to fully service base load needs in the emerging and developing countries.

India and China have more opportunity to investigate renewables on a large scale, due to their larger land masses, although some issues will still arise around large transmission distances from these renewable energy projects to major population centres. However, the majority of South East Asia, with small islands and premiums for land, will likely provide obstacles to large scale solar and wind implementation. Additionally, these areas are near the equator, including Thailand, Indonesia, Malaysia, Vietnam and to some extent India and Pakistan, with extreme storms and monsoon weather patterns likely to be an issue for coastal wind development and consistent uninterrupted power supply.

Growth in power demand is expected to be very strong in Central and South East Asia, but a number of coal fired power station projects have now been mothballed. This is making it difficult to forecast demand for coal imports over the next 10 years, as there is growing power demand, but no final decision on how it will be met by renewable energy sources (Global Energy Monitor, Global Coal Plant Tracker July 2020).

Several examples include (Global Energy Monitor, 2020):

- Bangladesh, which previously had a power station plan for 40,000 GW of new coal fired stations over the next 10 years. This has now been scaled back to 5,000 MW of new coal fired capacity, due to increasing environmental pressure, which will require more than 15 Mtpa of imported coal. There is no decision on how to supply the remaining power demand;
- Pakistan has just completed construction of 5,000 MW of new coal fired power stations, which is to be supplied 50% by imports. Pakistan has another 4,000 MW either approved or under construction, but the programme has been scaled back to 2,000 MW due to increasing environmental pressure. Import coal demand will be at least 15 Mtpa in the next 10 years, but potentially more if additional coal fired power station capacity is eventually approved;
- India has a program of 35,000 MW new coal fired power station construction, with another 11,000 MW approved. An additional 40,000 MW of coal fired projects have now been shelved due to environmental pressure, with again no decision on how to meet the forecast demand. Most of the approved capacity would be supplied by domestic coal, but it will require Coal India and the new private companies to increase coal supply by more than 200 Mtpa within the next 10 years from current production of 979 Mtpa in 2019. It is expected that domestic production will continue to fall short, particularly as India is targeting to direct

100 Mtpa into coal gasification by 2030. Therefore, India will have to rely on imports to meet the growing demand for thermal coal, which could reach at least another 50 Mtpa by 2030.

- Vietnam has constructed more than 15,000 MW of coal fired production with another 7,500 MW of new coal fired capacity under construction, 9,000 MW approved and now 4,000 MW shelved. This will see an increase in coal imports by at least 50 Mtpa, not including any of the power stations that have been shelved;
- Indonesia has a new construction program of 11,000 GW of coal fired production and another 3,000 MW approved, with 6,000 MW of new stations now shelved or on hold due to environmental pressure and no decision on replacement supply. Although this will not increase coal imports it will reduce the Indonesia export capacity by more than 60 Mtpa of coal which will be redirected to the domestic market through a Domestic Market Obligation (DMO).
- In addition to thermal coal this development will require increasing supply of metallurgical coal to meet the rapid growth in crude steel production. Growth in Asian steel demand, not including China is expected to grow by at least 5% per annum.

RMI concludes that, despite zero carbon emission targets, seaborne thermal and metallurgical coal demand into South East Asia, India, Pakistan and Bangladesh is likely to continue to grow for at least the next 10 years, possibly peaking around 2035. This is supported by the current programme for construction and approved construction of power stations and conventional steel mills over the next 10 years, including HELE coal fired technology in India, South East Asia and China. As most of this new infrastructure will have an operating life in excess of 30 years, we expect that the demand growth for thermal and metallurgical coal will remain flat from 2035 to at least 2060 as new energy and steel demand is progressively met by carbon neutral technologies, and then start to decline as existing infrastructure is retired and replaced by more carbon neutral technologies.

Most of the replacement technologies for steel manufacture, including hydrogen power and hydrogen steel, have yet to be commercially proven at an industrial scale, but renewable energy technology apart from batteries is well advanced. Zero carbon steel manufacturing technologies will therefore be adopted later and more slowly than renewable energy technologies, thus extending demand for metallurgical coal beyond the decline in demand for thermal coal. The very early stage of zero carbon steel manufacturing technology development, makes it very difficult to forecast when the demand for metallurgical coal may peak and start to decline. Adoption of any new technology is likely to be modest initially, and mostly in the developed economies of Europe, the USA, Japan and eventually China as existing coal-based infrastructure is replaced or retired. RMI expects that demand for metallurgical coal is likely to continue to grow in developing countries, including India and SE Asia.

## Global Coal Consumption and Trade

Global consumption of coal fell 1.8%, to 7,627 Mtpa in 2019 (IEA, 2020b), due to replacement by renewables and a higher percentage use of hydro power and natural gas. The strongest declines were in developed countries like Europe and the USA. The strongest declines in thermal coal consumption during 2019 were in the European Union (-19%, -111 Mtpa) and the United States (-14%, -87 Mtpa). By contrast in 2019, thermal coal consumption increased 1.2% (+69 Mtpa) in the Asia Pacific region.

IEA estimate that total coal demand fell by a further 5% in 2020 to 7,243 Mtpa (IEA, 2020), including a global decline in metallurgical coal consumption by 3.2% to 1,045 Mtpa from a peak of 1,080 Mtpa in 2019. The decline is largely due to the impacts of Covid-19.

The IEA is forecasting coal consumption to rebound by 2.6%, to 7,432 Mtpa in 2021 as a result of increased demand in China, India and South East Asia (IEA, 2020b). This includes growth in global metallurgical coal consumption of 3.7% to 1,084 Mtpa in 2021.

Despite the fall in global coal consumption in 2019, global coal trade increased by 0.8% from 2018, to 1,445 Mtpa, which is its highest recorded level. Coal trade accounted for 19% of global coal consumption in 2019. Thermal coal trade increased 1.1%, while metallurgical coal trade was stable. Thermal coal was 76% and metallurgical coal was 24% of the global coal trade in 2019, with over 90% being seaborne trade (IEA, 2020b). RMI estimates that total coal trade fell by around 10%, or 150 Mtpa in 2020, due to Covid-19, with at least 60% (1,213Mt) of this being seaborne trade. The largest contribution will be from India, which is expected to reduce imports by 40 Mtpa in 2020.

RMI forecasts that seaborne coal trade will rebound in 2021 by at least 60 Mtpa to 1,267 Mtpa, however, we anticipate that demand will not return to 2019 levels until at least 2022. The recovery will be supported by imports from India, Southeast Asia and stable demand from China, which had seaborne coal imports of 276 Mtpa in 2020 compared to 273 Mtpa in 2019.

Table 2: Seaborne Coal Imports

| Seaborne Coal Imports (Mt) | 2019 | 2020e | 2021f | 2022f | 2023f | 2024f | 2025f | 2030f |
|---|---|---|---|---|---|---|---|---|
| **India** | 247 | 215 | 225 | 255 | 265 | 275 | 285 | 310 |
| **China** | 273 | 276 | 280 | 290 | 295 | 300 | 305 | 340 |
| **Japan** | 186 | 173 | 175 | 185 | 185 | 185 | 180 | 180 |
| **Sth Korea** | 130 | 115 | 125 | 128 | 134 | 140 | 145 | 150 |
| **Taiwan** | 67 | 63 | 68 | 68 | 68 | 68 | 65 | 60 |
| **Vietnam** | 44 | 56 | 60 | 65 | 75 | 90 | 100 | 120 |
| **Pakistan/Bangladesh** | 20 | 22 | 24 | 28 | 32 | 36 | 40 | 58 |
| **EU** | 144 | 125 | 130 | 135 | 130 | 125 | 120 | 100 |
| **Other** | 201 | 168 | 180 | 190 | 190 | 185 | 180 | 160 |
| **World** | **1,316** | **1,213** | **1,267** | **1,344** | **1,374** | **1,404** | **1,420** | **1,478** |

Source: IEA, (Platts, 2021a), RMI.

Longer term growth trends are expected to return from 2022, particularly in South East Asia, India, China, Pakistan and Bangladesh. There will also be some modest growth from the Middle East and Northern Africa.

## Seaborne Thermal Coal Trade

Seaborne thermal coal trade is expected to rebound in 2021 and reach 2019 levels by 2022, as economies return to normal growth patterns. The developed economies of Europe and the USA will continue to gradually pivot away from coal fired electricity, but Asian growth and seaborne demand is likely to continue to grow over the next 10 years with an ongoing program of coal fired (HELE) power stations under construction in China, India, Vietnam, Pakistan, Indonesia, Myanmar and Bangladesh.

**Table 3: Seaborne Thermal Coal Imports Forecast**

| Seaborne Thermal Coal Imports (Mt) | 2019 | 2020e | 2021f | 2022f | 2023f | 2024f | 2025f | 2030f |
|---|---|---|---|---|---|---|---|---|
| India | 175 | 159 | 160 | 182 | 187 | 192 | 197 | 206 |
| China | 231 | 229 | 233 | 240 | 240 | 240 | 240 | 275 |
| Japan | 120 | 111 | 113 | 120 | 118 | 118 | 116 | 118 |
| Sth Korea | 95 | 85 | 93 | 93 | 99 | 105 | 110 | 120 |
| Taiwan | 66 | 62 | 65 | 65 | 65 | 65 | 65 | 60 |
| Vietnam | 39 | 50 | 52 | 53 | 60 | 72 | 80 | 95 |
| Pakistan/Bangladesh | 10 | 22 | 24 | 18 | 32 | 32 | 35 | 35 |
| EU | 85 | 75 | 80 | 84 | 76 | 73 | 70 | 54 |
| Other | 169 | 160 | 165 | 170 | 170 | 175 | 175 | 165 |
| **World** | **990** | **953** | **985** | **1,025** | **1,047** | **1,072** | **1,088** | **1,128** |

Source IEA, (Platts, 2021a), and RMI.

China is expected to modestly expand on current levels of thermal coal imports as domestic costs rise. There is an increasing gap between cheaper imports from Indonesia and Australia and increasingly high domestic prices, as Chinese wages continue to rise and mines also continue to get deeper. Mining resource depletion is more than 3.6 billion tonnes per annum in China so there is an almost 10-fold reduction in coal resources compared to the Australian coal industry, where just over 0.5 billion tonnes is extracted per annum. Most mining in China is now by underground operations and most mines are now in excess of 1,000 metres deep. This compares with Australian underground mines, which are generally less than 400 metres deep. Furthermore, at least 50% of Australian production is by cheaper open cut methods.

Although Australian coal is experiencing current trade barriers to China, these are expected to be resolved in the medium term. In the interim increased Chinese demand for coals from other countries like Indonesia, USA and Canada is now providing alternate markets for Australian coal, including Pakistan, India and even Europe. Chinese import demand is expected to peak by 2035, assuming China achieves its target of zero carbon emissions by 2060. Also, at current domestic mining rates, China will have consumed more than 36 billion tonnes of domestic coal resources, compared to less 5 billion tonnes by Australia over the next 10 years, thus further depleting China's least expensive and best quality resources.

India is expected to rapidly grow coal imports for both thermal and metallurgical coal over the next 10 years. Indian population is currently about 1.4 billion, with GDP growth expected to return to at least 7% per annum over the next 5 years. India has large resources of domestic thermal coal, but minimal metallurgical coal. Energy demand is expected to outstrip local thermal coal supply, with imports likely to be required to meet the shortfall. India has a target to increase domestic coal production from 950 Mtpa to at least 1.5 billion tonnes per annum, but has consistently fallen short of these targets by between 85% to 90% per annum. Indian domestic thermal coal is also relatively poor quality, with high quality Australian coal likely to be required for blending. Also India is aiming to direct 100 Mtpa into coal gasification by 2030, which will only increase reliance on imports to meet the growing thermal coal demand.

The current power station construction program involves 35,000 MW of new capacity under construction, and another 11,000 MW approved. Up to 40,000 MW of new capacity has been shelved due to environmental pressures, but this may be reinstated if renewable energy and LNG programs can't meet future energy demand.

Vietnam is also experiencing rapid population growth and has 15,000 MW of new capacity under construction, with another 7,500 MW approved. Vietnam will need to import thermal coal from Indonesia, Australia and to a lesser extent Canada and the USA, as they have a very small domestic coal industry.

Other rapid growth countries include Pakistan and Bangladesh, with populations of 221 million and 165 million respectively. Pakistan has just completed construction of 6,000 MW of coal fired capacity with another 4,000 MW approved or under construction. Bangladesh is in the final stages of commissioning 5,000 MW of coal fired capacity with another 30,000 MW now on hold due to environmental pressures. Both countries have small domestic coal industries with low quality coal and will require an increasing amount of imported coal as their power station construction programs roll out. Neither country has steel manufacturing capacity, and so currently don't import metallurgical coal. However, they have a significant crude steel import demand for infrastructure and building, which would be supplied from Turkey, Russia or China which all use metallurgical coal.

Developed economies like Europe, and the USA will be expected to move increasingly to lower carbon emission technologies and their coal demand imports are expected to steadily fall over the next 10 years. However, Japan still has a major program of power station construction, with 7,500 MW of new capacity HELE plants under construction and a further 2,500 MW approved. Some of this new capacity will replace older plants, but there is an expectation that Japan will require high quality thermal coal imports for the next 10 years to service these HELE plants. Demand is expected to peak about 2030, and then steadily decline.

### Seaborne Metallurgical Coal Demand

The largest metallurgical coal consumer is China, which accounted for 64% or 691 Mtpa of the global total in 2019 (IEA, 2020b). Other significant metallurgical coal consumers in 2019 included India 9%, Russia 7%, Japan 7%, European Union 6% and South Korea 5% (BREE, 2020c). Seaborne metallurgical coal demand represented 322 Mtpa of the 691Mt of total metallurgical coal consumed in 2019. The main participants in the seaborne metallurgical coal market are shown in Figure 3.

Table 4 summarises actual and forecast seaborne metallurgical coal imports. China imported 42Mt of seaborne metallurgical coal in 2019, and has been overtaken by India at 72 Mtpa of seaborne imports. Indian imports of metallurgical coal dropped to 56 Mtpa in 2020, but are expected to rebound to at least 65 Mtpa in 2022 and will likely continue to be greater than Chinese seaborne imports in the medium to long-term. Seaborne metallurgical coal imports are expected to fall significantly to 288 Mtpa in 2020, as a result of Covid 19. RMI forecasts a rebound in 2021, particularly with the strong performance from China, which imported slightly more coal in 2020, than in 2019.

A large part of non-seaborne trade is Mongolian coal, comprising 34 Mtpa in 2019, which is transported directly to northern China steel mills by truck and rail. Some Russian coal is also being railed directly to Europe (12 Mtpa).

Figure 3: Seaborne Metallurgical Coal Importers, 2020 estimate (Table 4)

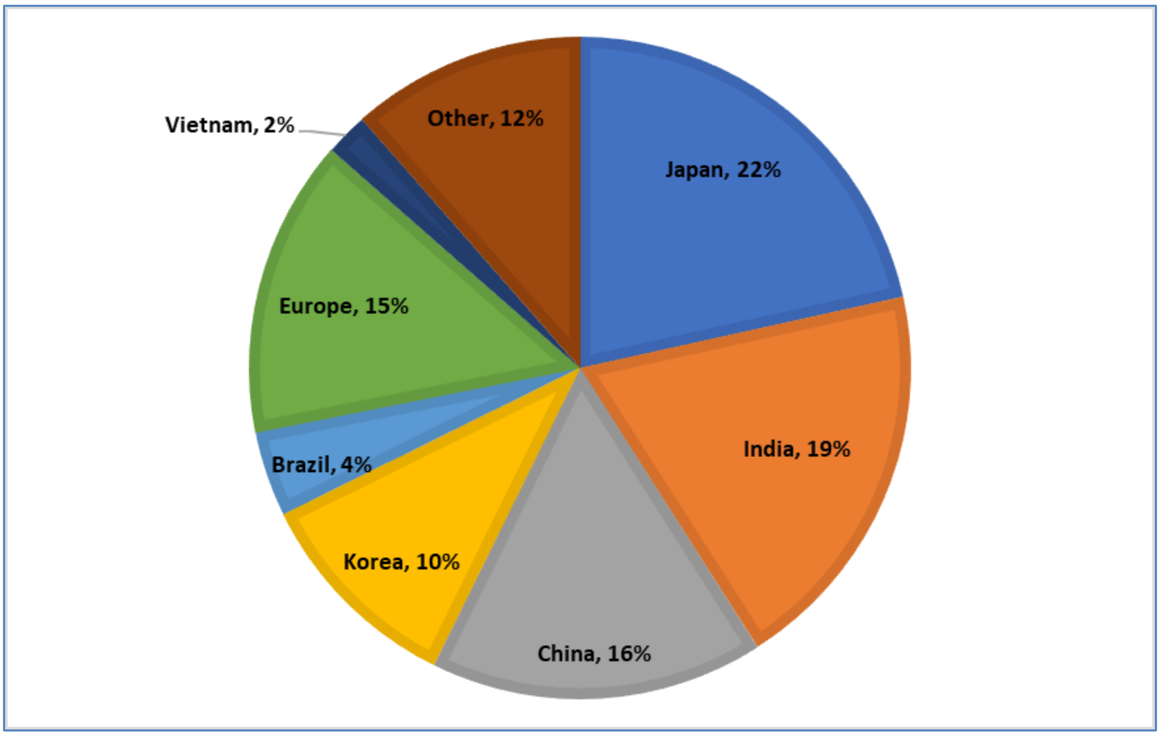



Table 4: Seaborne Metallurgical Coal Imports Forecast

| Seaborne Metallurgical Coal Imports (Mt) | 2019 | 2020e | 2021f | 2022f | 2023f | 2024f | 2025f | 2030f |
|---|---|---|---|---|---|---|---|---|
| Japan | 66 | 62 | 62 | 65 | 67 | 67 | 64 | 62 |
| India | 72 | 56 | 65 | 73 | 78 | 83 | 88 | 104 |
| China | 42 | 47 | 47 | 50 | 55 | 60 | 65 | 65 |
| Korea | 35 | 30 | 32 | 35 | 35 | 35 | 35 | 30 |
| Brazil | 16 | 12 | 14 | 18 | 18 | 20 | 20 | 22 |
| Europe | 48 | 42 | 44 | 51 | 54 | 52 | 50 | 46 |
| Vietnam | 5 | 6 | 8 | 12 | 15 | 18 | 20 | 25 |
| Other | 38 | 33 | 35 | 40 | 40 | 38 | 35 | 32 |
| **World** | **322** | **288** | **307** | **344** | **362** | **373** | **377** | **386** |

Source: IEA, (Platts, 2021a), and RMI.

Crude steel demand is expected to flatten in the developed economies like Europe with modest growth of less than 1.5% per annum. This is expected to have little impact on seaborne demand as the additional demand will be met by land-based supply from Russia and Poland, and eventually from new hydrogen and low carbon technologies from about 2030.

Chinese growth for seaborne metallurgical coal will be as a result of depletion in low cost, high quality domestic coking coal resources over the next 10 years. Despite relatively flat total demand, there will be a steady increase in demand of high quality and lower cost imported coal. Elsewhere in the South East Asia and Middle East and North Africa developing countries growth in seaborne demand will be greater than 6% per annum for at least the next 10 years as conventional BOF furnaces are constructed to meet growth in crude steel demand. New technologies like Hydrogen steel will not have any major impact in the medium term, but are likely to have an increasing influence on new demand from about 2035.

Other South East Asian countries that are expected to experience strong medium-term growth include Vietnam, Indonesia, Malaysia, the Philippines and Thailand. Although all have been impacted by the Covid 19 pandemic in 2020, they are expected to return to previous growth trends by 2022. Vietnam (population of 97 million) is leading the trend, with a current program of new BOF furnace construction, which is supported by Chinese and Korean steel mill investors. Indonesian demand (population of 275 million), which is forecast to grow strongly over the next 10 years, has 3.5 million tonnes (mmt) of new steel capacity starting production in 2020, and an additional 7.5mmt of new capacity under construction (OECD, 2020). Indonesia does have some supply of domestic metallurgical coal from Central Kalimantan, but will need to blend this with lower volatile matter, higher coke strength Australian coals to achieve a good quality coke for steel manufacture.

Malaysia, Thailand and the Philippines have no major BOF furnaces, and are not expected to have a direct need for metallurgical coal in the medium term. However, their requirement for crude steel imports from China, Japan, Korea and Vietnam to meet their growing infrastructure and development needs, will translate to increased demand for metallurgical coal.

## Seaborne Coal Supply

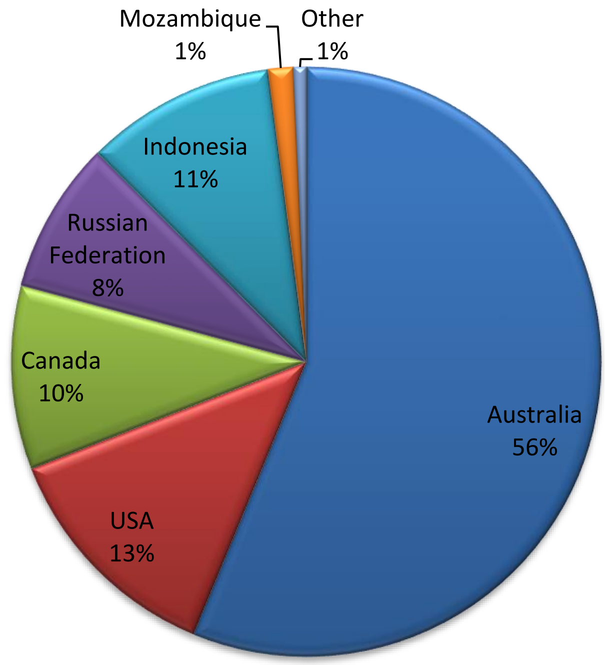
Global seaborne trade will continue to grow steadily over the next 10 years to meet coal demand in South East Asia, China, India, Pakistan and Bangladesh. The global seaborne trade is estimated to have fallen to 1,207 Mtpa in 2020 due to Covid 19, of which 76% was thermal coal and 24% was metallurgical coal. RMI expects global seaborne trade to rebound to at least 1,267 Mtpa in 2021, and to steadily grow to 1,478 Mtpa by 2030.

The major suppliers of seaborne coal are Indonesia, Australia, and Russia. Indonesia is by far the largest seaborne coal exporter at 450 Mtpa in 2019, of which 25 Mtpa is metallurgical coal. Australia is the next largest coal exporter with an estimated 396Mt in 2019, comprising 46% metallurgical coal. Australia is estimated to have exported 361 Mtpa in 2020, of which 53% was thermal coal and 47% was metallurgical coal. Russia is the next largest exporter at 192 Mtpa with 170 Mtpa of thermal and 24 Mtpa of coking coal in 2020.

Indonesia has a strong domestic demand for thermal coal, and also growing demand for metallurgical coal. Production is estimated to be 557 Mtpa in 2020 with a domestic market obligation (DMO) of 108 Mtpa, leaving exports at 450 Mtpa. The DMO is for thermal coal and is expected to steadily rise over the next 10 years, taking a further 100 Mtpa of coal out of the export market. The shortfall in seaborne supply will be supplied mostly by Australia, South Africa, Russia and Mozambique.

The main focus for this section of the report is seaborne metallurgical coal supply, which currently comprises more than 80% of DBCT throughput, and is likely to continue to dominate in the medium to long term. While China is the largest producer of metallurgical coal, it is also the largest consumer. The major global exporters, or suppliers of seaborne metallurgical coal are shown in Figure 4.

**Figure 4: Seaborne Metallurgical Coal Exporters, 2020 estimates**




Source: IEA, (Platts, 2021a), and RMI.

Australia is in a very strong long-term position to meet future metallurgical supply, with the best quality and lowest cost metallurgical coals coming mainly from Queensland's Bowen Basin. Most of Australia's international competitors in the metallurgical coal market, including Chinese domestic suppliers, have poorer quality, higher and increasing mining costs, restrictions on infrastructure or maturing mines.

## International Metallurgical Coal Suppliers

A major competitor is the USA which exports metallurgical coal from the east coast of the USA. This is a very mature industry and has been operating for more than 150 years. Their export competitiveness into Asia did improve over the last couple of years with the upgrade of the Panama canal to accept Post Panamax vessels of at least 140,000 dwt, but it has ageing coal mines and still has significant shipping costs compared to Australia. The major US exporters are Coronado Coal (6 Mtpa of exports), Peabody (2 Mtpa of exports) and Arch (6 Mtpa of exports). At least half of this production has a life of less than 20 years with limited future expansion or life extension potential.

The US will export 37 Mtpa of metallurgical coal in 2020. This should rebound to at least 38 Mtpa in 2021, but the US is very much a swing supplier, and are often the first suppliers to retreat from the market when coal prices are low. Many US companies are in a poor financial position, as a result of low coal prices over the last 2 years, with high levels of debt. A number of mines have been placed on care and maintenance and most companies have experienced Chapter 11 restructuring over the last 5 years. Some mines can be returned to production when market conditions improve, but very little capital is now going into new production capacity. RMI expects that the maximum limit of future US seaborne metallurgical supply will probably be capped at around 45 Mtpa. Export production is expected to peak in 2035 and then fall to around 20 Mtpa for the longer term.

Canada is the next largest exporter of metallurgical coal. Mining is undertaken in British Colombia and Alberta, from where there are long rail distances to west coast export ports. It is expected that exports in 2020 will fall to 29 Mtpa and rebound to 32 Mtpa in 2021. Teck Corporation is the major producer with 25 Mtpa of export metallurgical coal capacity. One of their mines, Grand Cache (3 Mtpa) is currently on care and maintenance and could be brought back on-line with improving coal market pricing. Up to 9 Mtpa of Teck capacity would have depleted mine resources by 2050, and Teck have no new designated coal projects.  Canada has limited future expansion potential, with at least two mines on care and maintenance that could return with a capacity of around 5 Mtpa. One advanced green field project, Grassy Mountain, which is being developed by Hancock Mining, has 4 Mtpa capacity over 25 years. It is at least 3 years from initial production. Canada also has limited port capacity expansion potential. Coal prices would have to move significantly to justify the capital expenditure for significant new port capacity in Canada.

Russia is a competitor with both land and seaborne supply of metallurgical coal. There are several projects targeted by Evraz, which currently exports more than 6 Mtpa of metallurgical coal and has more than 1.9 billion tonnes of coal resource potential. Evraz would have a capability to expand production as export demand grows. Russia has recently increased exports to Turkey, China and India, and has been aggressively trying to expand into the SE Asia market. Mine production costs are low, but rail distances of over 3,000 km to export ports result in relatively high export costs. Expansion of Russian coal supply is dependent on high coal market pricing but could produce at least another 20 Mtpa to meet European, North Asian and Turkish market demand.

There is one major coal mine in Mozambique which is operated by Vale, Moatize, and also a smaller mine, Beira, operated by Jindal Africa. Production in 2020 was significantly impacted by Covid 19 and is expected to fall to less than 10 Mtpa, of which 6 Mtpa is coking coal. There is potential to rebound to at least 9 Mtpa of coking coal exports in 2021, dependent on coal market conditions and the countries positive response to Covid 19. Export infrastructure has a capacity to expand to 12 Mtpa with up to 9 Mtpa available for coking coal exports. Although there are major resources of coking coal in Mozambique, RMI does not expect that market economics will support infrastructure upgrades in the medium term.

Indonesia has potential to continue to develop metallurgical coal mines in Central Kalimantan. However, there are currently logistical constraints associated with long distance river barging on the Barito River, and lower water levels during dry periods. There has been ongoing discussion for more than 10 years to construct rail and/or road connections for future expansion and all-weather supply for the 200km haulage distance to deep water barge stations on the south coast. Currently there has been no capital provided for these projects and most mine owners are medium to small scale and don’t have the balance sheets to support big infrastructure projects. Additionally, Indonesian metallurgical coal may be increasingly directed into the domestic crude steel market so there is limited upside for major export metallurgical coal expansion.

### Australian Metallurgical Coal Suppliers

The main metallurgical coal producing areas in Australia include the Bowen Basin in Queensland, and the Southern Coalfield and Hunter Valley areas in New South Wales. The Bowen Basin has the largest and lowest cost resources of high quality metallurgical coal.

Underground mines in the Southern Coalfield to the south of Sydney, which export from Port Kembla, have high quality metallurgical coal but are comparatively higher cost mines with limited potential to expand production. South32 is the dominant producer in this area, at about 7 Mtpa, of which some is sold to a steel mill at Port Kembla. Their Dendrobium mine had applied for a production upgrade, which has just been refused by the Independent Planning Commission due to concerns over water catchment impacts from longwall mining. This may reduce planned mine life. Other mines in the Southern Coalfield include Metropolitan (Peabody), which is about to be closed, Wollongong Coal (Jindal) mines Russell Vale and Wongawilli, which are currently under Care & Maintenance, and Tahmoor mine (Gupta), which is expected to produce about 2.5 Mtpa of mostly metallurgical coal over a 10 year mine life. Russell Vale and Wongawilli have a potential to produce up to about 3 Mtpa each, but have significant environmental and transport constraints to port. Port Kembla metallurgical coal throughput, which is estimated to be 4 Mtpa in 2020, should increase to 5.5 Mtpa in 2021 as the Russell Vale mine restarts. There is limited expansion capacity at Port Kembla, but metallurgical coal exports may grow to 6-7Mtpa over the next 2-3 years as both Russell Vale and Wongawilli mines are brought back into production. This increase in exports will be offset by the closure of the Tahmoor mine in about 2030.

The other NSW metallurgical coal mining area is the Hunter Valley which produces mainly semi soft coking and thermal coal for export from Newcastle Port. The Hunter Valley is generally not a direct competitor with the Bowen Basin, due to the poorer quality coking coals produced, but semi soft coking coal market share tends to increase when hard coking coal prices are high. Metallurgical coal exports from Newcastle Port are expected to rebound from 12 Mtpa in 2020 to 15 Mtpa in 2021. There is limited potential to increase metallurgical coal production from Newcastle Port, due to depletion of Hunter Valley semi soft coking coal resources.

### Bowen Basin Coal Suppliers

The Bowen Basin is the major exporter of premium quality metallurgical coal. Five dedicated export terminals service the area, including Abbott Point (APCT) in the north, Dalrymple Bay and Hay Point near Mackay, and the RG Tanner and WICET export terminals in the south near Gladstone (Figure 1).

Key metallurgical coal mines currently utilising Abbott Point terminal include Collinsville (Glencore), Newlands suite of mines (Glencore) Byerwen (QCoal) and some mines on the Goonyella Rail System. Collinsville has a limited production capacity and mine life, while Newlands is expected to be closed by 2023. However, Byerwen is a key producer of premium quality hard coking coal going forward, with current sales expected to increase from 6 Mtpa in 2020 to at least 12 Mtpa over the next 3 years. APCT is considered to be the other main export terminal being used by producers of high quality metallurgical coal, with DBCT and HPCT being the main terminals being used.

Key metallurgical coal suppliers utilising the Gladstone export terminals include, Curragh, Blackwater, Kestrel and Jellinbah, which variously produce medium quality coking and PCI products for export. All have long term coal resource potential. Kestrel underground is being expanded to 10-11Mtpa saleable by 2023, while Coronado plans to expand the Curragh operation by at least another 3 Mtpa to 15 Mtpa from 2024. The Gregory-Crinum mine complex was acquired by Sojitz Blue from BMA early in 2019, with first coal produced from Gregory opencut in October 2019. Opencut production of up to 2.5 Mtpa is expected to increase to 3.5 – 4Mtpa as the Crinum underground is reopened in 2021. However, none of these mines produce the premium quality metallurgical coals that characterise the Goonyella corridor. Other projects on the Blackwater Rail System that have near-term potential include the eventual restarting of Cook Colliery (2.5 Mtpa), and Bluff Coal (1.5 Mtpa), which produce standard – low quality hard coking coal. Longer term development projects producing similar products are held by QCoal, near Blackwater and by Bowen Coking Coal (McKenzie). These could add at least another 5 Mtpa, but are unlikely to start for at least another 5 years.

Therefore, while there is significant metallurgical coal supply competition from mines in other areas of the Bowen Basin, which deliver product to Abbot Point or Gladstone export terminals, only the Byerwen mine produces a premium quality hard coking coal product.

### Goonyella Rail System Suppliers

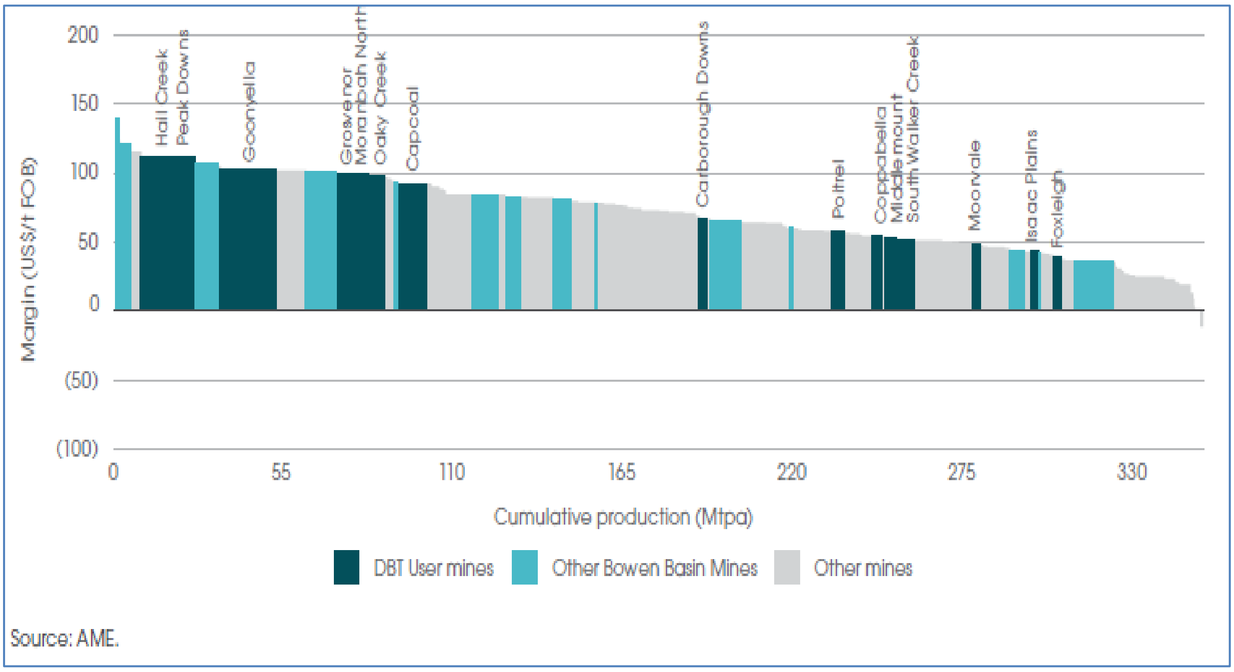
There is a large number of operating mines and development projects located within the Goonyella Rail System corridor (Figure 2), which can provide long term supply to Dalrymple Bay and Hay Point to meet the forecast growth in metallurgical coal demand. Operating mines, which are listed in Table 5, produce a range of products from premium quality coking coal to other metallurgical products and thermal coal. Metallurgical products dominate supply from the Goonyella Rail System corridor, with most supplying premium quality hard coking coal and Pulverised Coal Injection (PCI) products. North Goonyella is currently suspended due to gas related operational issues. Norwich Park opencut, which has been under Care & Maintenance since May 2012, has been considered as a development project.

Work done by AME for the Dalrymple Bay Infrastructure (DBCTM) Prospectus (DBI, 2020) confirms that Bowen Basin metallurgical coal mines generally achieve higher prices, have lower costs and attain higher margins than other regions globally (Figure 5), due to high product quality commanding higher prices, favourable geology resulting in lower mining costs and relatively low delivery costs (DBI, 2020). Mines within the Goonyella Rail System corridor in particular rank amongst the highest margin metallurgical coal producing mines (Figure 5).

Several Goonyella System operating mines, including Grasstree, Clermont, Lake Vermont, Coppabella and Moorvale opencut are expected to have a limited mine life of from 5 – 8 years, while Peak Downs, Saraji and Broadmeadow have from 50 to 80 plus years of supply potential at current production rates. These estimates are based on reported JORC Reserves and additional Measured and Indicated Resources only, as is further discussed in Section **Indicative Saleable Product Estimation.** A supply forecast for the DBCT and HPCT export terminals is assessed in Section **DBCT Coal Supply Forecast.**

There is a very large number of coal development projects within the Goonyella Rail System corridor, which are at various stages of development. All projects, which RMI has ranked in terms of their development potential (refer Section **Viable Projects**), are listed in Appendix B1, B2, B3 and B4 depending on rank.

**Figure 5: Global Metallurgical Coal Cost Margin Curve, 2019**




Notes: Source: AME in (DBI, 2020); 2019 average premium HCC price of US$181/tonne FOB) and LVPCI average contract price of US$130/t FOB. AME calculate margin by taking estimated price received at each mine (which may be at a premium or discount to benchmark) minus FOB cash costs, including royalties, but excluding depreciation and sustaining capital expenditure.

Many projects, such as Capcoal Aquila (Anglo American), Isaac Downs (Stanmore), Olive Downs North (Peabody) and Bee Creek, Red Hill, South Walker Creek and Saraji East (all BMA), are at an advanced stage of development (Rank 1 or 2) and are essentially ready to replace adjacent operations as coal Reserves are depleted. Other Rank 1 or 2 advanced projects, such as Ironbark No1 (Fitzroy Resources), New Lenton (New Hope) and Moorlands (Cuesta Coal), have acquired access to adjacent existing infrastructure, which reduces development costs. These projects are ranked as Brownfields projects (refer Section **Viable Projects**). Other advanced projects, such as Dysart East (Bengal Coal), Eagle Downs (South32/Aquila Resources), Moranbah South (Anglo American), Olive Downs (Pembroke Resources), Styx (Central Qld Coal), Vulcan Mine (Vitrinite), Winchester South (Whitehaven) and Hillalong (Shandong Energy) have with no existing mining or coal transport infrastructure and are ranked as Greenfields projects.

RMI estimates that the sum total of Marketable Reserves reported for operating mines within the Goonyella Rail System corridor is approximately 2,495Mt, with an additional 4,414Mt of in-situ Resources classified as either Measured or Indicated. Similarly, the sum total of Marketable Reserves reported for Rank 1 and 2 projects within the Goonyella Rail System corridor is approximately [redacted]Mt, with an additional [redacted]Mt of in-situ Resources classified as either Measured or Indicated. RMI notes that these figures rely on company reported Reserves and Resources, which we have observed are mostly, but not entirely, reported in accordance with the JORC Code (JORC, 2012).

**Table 5: DBCT and HPCT Catchment Area Operating Mines**

| Mine Name | Operator | Status | Mine Type | Saleable Production (Mtpa) | Potential Port Destination |
|---|---|---|---|---|---|
| Capcoal Opencut Complex | Anglo American | operating | opencut | 3.5 | DBCT |
| Grasstree | Anglo American | operating | longwall | 5.3 | DBCT |
| Grosvenor | Anglo American | operating | longwall | 3.6 | DBCT |
| Moranbah Nth | Anglo American | operating | longwall | 6.5 | DBCT |
| Broadmeadow U/G | BMA | operating | longwall | 4.6 | HPCT/APCT |
| Caval Ridge | BMA | operating | opencut | 7.7 | HPCT |
| Daunia | BMA | operating | opencut | 4.4 | HPCT |
| Goonyella/Riverside | BMA | operating | opencut | 16.9 | HPCT/APCT |
| Peak Downs | BMA | operating | opencut | 12.1 | HPCT |
| Saraji | BMA | operating | opencut | 9.9 | HPCT |
| Poitrel | BMC | operating | opencut | 4.1 | DBCT |
| South Walker Creek | BMC | operating | opencut | 5.9 | DBCT |
| Carborough Downs | Fitzroy Resources | operating | underground | 2.2 | DBCT |
| Clermont | Glencore | operating | opencut | 11.4 | DBCT |
| Hail Creek | Glencore | operating | opencut | 9.1 | DBCT |
| Oaky North | Glencore | operating | longwall | 5.2 | DBCT |
| Lake Vermont | Jellinbah Group | operating | opencut | 8.5 | DBCT/APCT/GCT |
| Coppabella | Peabody | operating | opencut | 3.2 | DBCT |
| Middlemount | Peabody | operating | opencut | 2.8 | DBCT |
| Moorvale O/C | Peabody | operating | opencut | 1.7 | DBCT |
| North Goonyella | Peabody | Suspended pending resolution of gas issues | longwall | 2.2 | DBCT |
| Foxleigh | Realm Resources | operating | opencut | 3.5 | DBCT |
| Isaac Plains Mine | Stanmore | operating | opencut | 2.4 | DBCT |
| Blair Athol | Terracom | operating | opencut | 2.4 | APCT/DBCT |

Notes: DBCT Dalrymple Bay; HPCT: Hay Point; GCT: RJ Tanner(Gladstone); APCT: Abbot Point;
Source: RMI data compilation

## DBCT Coal Supply Conclusions

RMI concludes that, with the possible exception of Russia, there is limited metallurgical coal supply capacity outside of the Bowen Basin that could compete with Bowen Basin coals in terms of product quality and cost of supply. Demand for these coals is expected to remain strong until at least 2035, and then be sustained until at least 2060. Collectively, the USA, Canada and Mozambique can provide some export growth potential for an additional 25 Mtpa of metallurgical coal over the next 10 years, but resource depletion will then impact supply potential, particularly from USA mines. Seaborne metallurgical coal demand is expected to rise by about 100 Mtpa to 386Mtpa by 2030.

Russia has extensive resources of low-cost medium to high quality metallurgical coal. Its main constraint to export potential is the long rail distances, but the Government has gradually been upgrading rail tracks and rolling stock. A new northern rail link from China, through Mongolia and via the main Russian east west line, will support future growth in exports to China. There is potential for at least another 20 million tonnes of metallurgical coal exports over the next 10 years and this could be maintained for at least another 15 years.

Indonesia also provides some upside for new metallurgical coal supply, but the low rank and high volatile nature of Indonesian coals is expected to limit its market share, and these coals may also be required for domestic steel production demand. The current constraint to growing supply is the long barging distances and low dry season water levels. Either the Government or the mining companies will have to fund either rail or road haulage to a deep water barge stations, to boost export or domestic supply potential. Indonesian coal will still need to be blended with some high quality Bowen Basin coal to achieve good strength coke.

RMI further concludes that the Bowen Basin, and in particular the Goonyella Rail System corridor, is in a very strong competitive position to maintain a dominant market share over the long term, in a growing metallurgical coal market. We consider there is limited Australian supply capacity outside of the Bowen Basin, to meet the expected growth in metallurgical coal demand. RMI expects that supply capacity from for example Indonesia, the USA, China and the NSW Southern Coalfield, will reduce within a 30-year time frame, thus increasing demand from the Bowen Basin, which has ample high quality, lower cost metallurgical coal resources.

RMI also concludes that there is likely to be insufficient premium quality metallurgical coal supply capacity within the Abbot Point and Blackwater Rail System corridors of the Bowen Basin, to meet the expected 104 Mtpa growth in metallurgical coal demand to 2030. We therefore conclude that there is likely to be sufficient demand for metallurgical coals from the Goonyella Rail System to support continued operation and probably expansion of DBCT over the long-term. DBCT supply life is further considered in Section **DBCT Coal Supply Forecast**.

Current thermal coal supply to DBCT comprises less than 20% of total throughput. While several mines within the Goonyella Rail System export thermal coal as a minor secondary product, only Clermont (11.4Mtpa) and Blair Athol (2.4Mtpa) export only thermal coal. Additional thermal coal supply potential is likely to come from development of the Moorlands (Cuesta Coal) and Lake Elphinstone (Glencore) and Styx (Central Queensland Coal) projects, which are likely to supply up to 15Mtpa of additional thermal coal supply. However, RMI concludes that, while the proportion of DBCT thermal coal throughput is likely to remain small, the relatively high quality (compared to Indian and Pakistan coals) and low cost of thermal coal supply from the Goonyella Rail System corridor, is likely to result in continued South East Asian demand for thermal coal via DBCT over the medium to long term.

# Methodology for DBCT Asset Life Estimation

## DBCTM 2019 DAU

The DBCTM 2017 access undertaking notionally terminates on 1 July 2021. The 2019 Draft Access Undertaking (DAU), which was lodged by DBCTM on 1 July 2019, is currently being assessed by the QCA. A critical element of the 2019 DAU is the economic life of the DBCT terminal assets, which is determined for the purposes of estimating depreciation and remediation allowances. The 2019 DAU has proposed to align asset life with the remaining length of DBCTM's initial lease period, which is a period of 31 years to September 2051.

Previous DAU proposals have assessed the useful life of DBCT assets as being related to the economic life of coal supply from the DBCT catchment area. The economic life of the DBCT terminal assets is assessed in the current 2017 DBCT Access Undertaking as the period to 2054, which is based on a review of the economic Life of DBCT assets undertaken in 2005 (Energy Economics, 2005) for QCA's assessment of DBCTM's 2005/2006 DAU.

The brief of this assessment is to undertake an independent assessment of the economic life of the DBCT assets, based on a reasonable assessment of coal supply life from the DBCT catchment area.

## Previous Methodologies

DBCT's economic life has in the past been determined as 50 years to 2054. However, catchment area coal supply has also been considered, with the result varying according to the method and date of the analysis.

DBCT catchment area coal supply life assessments have been undertaken by various consultants in previous years, including Barlow Jonker for DBCT Management (Barlow Jonker, 2004), Energy Economics for QCA (Energy Economics, 2005) for the 2005/2006 DAU review, Wood Mackenzie for DBCTM in 2015 (Wood Mackenzie, 2015), and by Resource Management International to assist QCA's assessment of the 2015 DAU (RMI, 2015).

These studies have all used a similar approach, which involved compilation of coal reserve and resource estimates for mines and projects occurring within the DBCT catchment area, from which reasonable estimates of "indicative saleable reserves" and annual production rates were determined. We note this includes mines and projects owned by BMA and BMC, which supply coal to the HPCT and DBCT. The life of Goonyella Rail System corridor coal supply was essentially determined from total indicative saleable product divided by DBCT/HPCT annual capacity.

Two methods were used in RMI's review of the 2015 DAU as follows:

**Method 1:** Coal supply life was determined using the following expression:

*DBCT asset life = [Total Indicative Marketable Reserves] / [annual capacity]*

Total 'Indicative Marketable Reserves' was determined for all operating mines and advanced projects within the DBCT catchment area. Advanced projects included projects with a ranking of B1, G1, B2 and G2 as described below. Projects with a ranking of G3 and B3 were excluded.

BMA and BMC supply was also considered in the analysis. It was assumed that most BMA/BMC coal would be exported from the BMA owned HPCT facility, which was assumed to have a capacity of 55Mtpa at 100% utilisation. The DBCT facility was assumed to have a capacity of 85Mtpa, of which 80Mtpa was available to non-BMA/BMC mines and projects at 100% utilisation. RMI now assumes that there is more BMA/BMC coal being supplied to DBCT and that it would be more appropriate to adopt a more realistic utilisation percentage.

**Method 2:** DBCT asset life was determined from annualised scheduling of 'Indicative Marketable Reserves' for each operating mine and advanced stage project, using reasonable estimates of annual production rates. This method essentially provided the same answer as the Method 1 analysis, but also provided an assessment of the timing of eventual decline in coal supply from the Goonyella Rail System corridor. RMI considered that this would be useful in determining when the minimum level of coal supply that could sustain DBCT function may be reached.

## Current Assessment Methods and Assumptions

### DBCT Catchment Area Assumptions

The DBCT catchment area is assumed to be the area serviced by the Goonyella Rail System (GRS; See Section **DBCT Catchment Area Assumptions**), which essentially provides the least cost railing option for mines and projects along or close to this rail link.

RMI recognises that the GRS is connected to the Goonyella-Abbot Point System to the north and the Blackwater Rail System to the south, which provide potential rail links to the Abbot Point Coal Terminal (APCT) and RG Tanner/WICET coal export facilities respectively for mines and projects within the Goonyella Rail System corridor. While this provides producers with potential alternative coal export facilities, railing distance and cost are likely to be priority considerations for most mines and projects. Mining projects located near the northern and southern ends of the GRS may consider several coal export options before finalising port allocation agreements.

RMI has assumed that all mining projects to the north of North Goonyella mine are likely to rail coal to APCT, and all projects south of Oaky Creek mine are likely to rail coal to the RG Tanner or WICET coal export terminals. RMI has assumed that the New Lenton project, which is to the northwest of North Goonyella mine, is likely to rail coal to DBCT via existing Burton mine infrastructure and GRS rail link.

However, RMI is aware that some mines on the GRS, such as [redacted] do not have an Access Agreement with DBCTM, or have Access Agreements for only a proportion of their annual production. However, it is likely that these mines will from time to time utilise spare allocations from other users (DBCTM, 2019), but there may be times when none are available. [redacted] They are likely to apply for allocations in the future as DBCT capacity is increased or other users relinquish allocations.

Consequently, we have assumed that all operating mines deliver 100% of production to DBCT, but have proportionately reduced supply from [redacted] in the short-term if total supply exceeds DBCT System Capacity at 95% utilisation.

### Information Database

The current assessment is based on a database of information for all operating mines and significant mining projects within the Goonyella Rail System corridor. The database is derived from company Annual reports, ASX announcements, web sites, public records and RMI knowledge, and records the latest available information regarding:

- Mine and project ownership;
- Stage of development;
- Mining method and likely mining recovery, utilising current technologies and efficiencies;
- Saleable production rate history;
- Product types, saleable production rates and product yield;
- Latest JORC saleable reserves and in-situ resources (Measured + Indicated and Inferred);
- Data source.

The database includes information on BMA and BMC owned mines and projects, as a proportion of supply from these mines or projects may potentially be supplied to DBCT. The assessment of DBCT supply life assumes that BMA owned supply will be preferentially exported via HPCT, while RMI is aware that most BMC supply is exported via DBCT.

Reported Marketable and Run-of-Mine (ROM) Reserves for operating mines, which are reported at various dates, have been normalised to 31 December 2020, after accounting for production from the reporting date. Similarly, reported JORC in-situ Measured + Indicated (M&I) resources have been adjusted where necessary to be exclusive of Reserves as at December 2020, using the following formula:

*M+I Resource = Reported* M&I *resource – ROM Reserves – (saleable production/mining recovery/product yield)*

While this may not fully account for coal resources that may have been sterilised (i.e. made unmineable) by past production, RMI considers it is a reasonable estimate for the purposes of this assessment.

Processing yield has been determined specifically for each mine or project from the available information. A yield of 65% has been assumed in the absence of relevant information. Mining recovery has been determined based on mining method, but we have assumed a mining recovery of 90% for opencut mines and 65% for underground mines, in the absence of specific information.

### Viable Projects

There is a very long list of potential projects within the Goonyella Rail System corridor, which are at various stages of project feasibility assessment from early exploration to Environmental Impact Statement (EIS) approvals and bankable feasibility study (BFS) stages. There are also extensive coal resource target areas held under exploration licences. While many of the identified projects are not currently viable, viability is likely to improve as existing mines are exhausted, and as the market environment changes. RMI considers that project viability also becomes clearer as more information is collected and development approvals progress.

We have ranked the prospectivity of each project, based on the nature and stage of current development, as follows:

1. Ease of development: Projects have been classified initially as either:
    - Brownfields projects, which are advantaged by having existing mine infrastructure available. These have been assigned a B ranking; or
    - Greenfields projects, which are disadvantaged by having no existing mining or coal processing infrastructure, or established rail loadout link. These projects have been assigned a G ranking.
2. Stage of project development: Projects have then been further ranked as follows:
    - 1 = projects with mining feasibility or pre-feasibility investigations underway or completed, development approvals at an advanced stage and significant JORC reserves have been announced. The start-up timing for B1 and G1 projects may be delayed or brought forward, depending on demand or until adjacent reserves are depleted;
    - 2 = projects in the mine planning stage or advanced exploration stage, where there are significant Measured and Indicated JORC resources reported, possibly a conceptual mine plan and the approvals process started; and
    - 3 = projects in the early exploration stage, with insignificant Measured and Indicated JORC resources reported.

### Indicative Saleable Product Estimation

Indicative Saleable Product is defined for the purposes of this assessment, as the total quantity of saleable coal that would reasonably be expected to be supplied over the life of an existing mine or development project. It is equivalent to 'Indicative Marketable Reserves' as used in the 2015 DAU assessment (RMI, 2015), which hasn't been used to avoid confusion with the term Marketable Reserves as defined in the JORC Code 2012. RMI emphasises that Indicative Saleable Product is not a JORC Code terminology, and does not satisfy the requirements for mine planning and reporting under the JORC Code 2012. It is intended to provide a broad-brush estimate of the likely minimum period of coal supply to the port, and is not intended to be an estimate of 'Marketable Reserves' as defined in the JORC Code (refer Appendix A).

Determination of Indicative Saleable Product from JORC Marketable Reserves alone would typically underestimate saleable coal supply potential. It has been estimated as follows:

*Indicative Saleable Product = Marketable Reserves + Additional Saleable Coal*

*Where:*

*Additional Saleable Coal = (Measured + Indicated Resources) * Mining Recovery * Yield*

RMI has only considered total Indicative Saleable Product for operating mines, and projects with a viability ranking of B1, G1, B2 and G2. Furthermore, only JORC Measured and Indicated Resources are considered in the estimation of Indicative Saleable Product for each mine or project, because Inferred Resources are by definition not defined with sufficient certainty under the JORC Code 2012 for mine planning purposes. However, Inferred Resources may be considered in the context of upside supply potential.

### Estimation of Catchment Coal Supply Life

RMI has adopted a similar methodology to that used in our review of the 2015 DAU. Indicative Saleable Product has been estimated in a similar manner, as described above, while relevant mine and project data that has been updated. HPCT capacity remains the same, and there is no evidence to suggest BMA have plans to increase HPCT throughput capacity. However, DBCTM expansion plans, as described in Section **Dalrymple Bay Coal Terminal**, have been accounted for. The variation in DBCT capacity makes the Method 1 estimation less simple to apply, and we have opted to mainly follow the Method 2 scheduling methodology used in the 2015 DAU assessment (RMI, 2015).

In applying the Method 2 analysis, RMI has made the following assumptions:

- Operating mines and B1 and B2 projects have been scheduled for the life of their Indicative Saleable Product inventory;
- Operating mine production rates are based on historical data over periods that represent current production capability, technology and efficiencies;
- Project production rates have been estimated, based on site-specific information or the proposed mining method and nature and size of the resource. Project production rates are ramped up at the start of mining to the average estimated saleable production rate;
- Production rates for mines and projects are maintained at the average rate over the mine or project life, unless expansion plans have been announced with reasonable certainty;
- The timing of new projects starting up takes account of DBCT and HPCT throughput capacity, total DBCT Access allocations, operating mine closure, and the global demand outlook for DBCT catchment area coals;
- DBCT system capacity is assumed remain at 84.2Mtpa (name plate 85Mtpa) until end 2024, after which capacity is assumed to ramp up to 87Mtpa in 2025, 92.5Mtpa in 2026, and 97.5Mtpa in 2027 as a result of the planned 8X capacity expansion;
- We have not accounted for the 9X expansion to 135.7Mtpa, which has no set timing;
- Capacity utilisation is assumed to average 95% at both terminals. This is significantly higher than actual utilisation (refer Section **Dalrymple Bay Coal Terminal**), which averages 87% at HPCT and 81% at DBCT. However, we have assumed that terminal utilisation would increase with demand. This is a conservative position in the context of this investigation, as any further reduction in utilisation would only extend catchment coal supply life.
- Given our expectation of positive **growth** in demand for Australian and especially Bowen Basin metallurgical coals to at least 2035, and then steady demand to at least 2060, we have assumed that total supply to DBCT and HPCT is maintained at marginally less than 95% utilisation of DBCT and HPCT capacity;
- We have ensured that total DBCT supply does not exceed total HPCT and DBCT Access allocations, which have been scheduled to 2028 in accordance with the information available. We have then assumed that the 2028 allocations, which include allocations conditional on the 8X expansion (refer Section **Dalrymple Bay Coal Terminal**), will subsequently be renewed or taken up by other users as mines are depleted. We have not included the current conditional Access Queue allocations as additional throughput capacity, as these are dependent on either the 9X capacity expansion or other users relinquishing Access allocations;
- We have assumed that mines without full Access allocations will use spare DBCT Access allocations if they are available, or rail to other export terminals.

# DBCT Asset Life Estimation

## Indicative Saleable Product Estimates

Appendix B1 summarises assumptions, Marketable Reserves, additional Measured + Indicated Resources and Indicative Saleable Product for all currently operating mines within the Goonyella Rail System corridor. Appendix B2 and B3 summarise the same information for advanced (rank 1) and medium term (rank 2) projects within the Goonyella Rail System corridor. Appendix B4 lists all other projects, which are considered to be long term prospects, and for which Resource estimates are typically uncertain. Table 6 summarises all results.

Total estimated Indicative Saleable Product for operating mines and advanced (B1, G1, B2 and G2) projects is about [redacted] Mt, including BMA/BMC mines. About 4,705 Mt of this is BMA/BMC supply, of which up to 13 Mtpa may be delivered to DBCT. This represents a theoretical supply life of about 65 years to 2085, assuming the current combined DBCT and HPCT capacity of 140 Mtpa and 100% utilisation. We have combined DBCT and HPCT capacity because from 8 – 13 Mtpa of BMA/BMC coal is delivered to DBCT. However, this does not account for the following:

- proposed increases in DBCT throughput capacity, nor
- deliveries of minor quantities of coal to other ports, nor
- the tailing off of coal supply as many mines and projects are depleted.

This is further assessed below using the scheduling methodology.

**Table 6: Summary of Indicative Saleable Product Estimates**

| Asset Status | Owner | Marketable Reserves, JORC (December 2020) | Additional Measured & Indicated Resources JORC (December 2020) | 'Indicative Saleable Product' (December 2020) | Inferred Resources, JORC (December 2020) |
|---|---|---|---|---|---|
| Operating Mines | BMA/BMC | 1702.8 | 2347.2 | 2964.9 | 2964.9 |
| | Other | 792.2 | 2066.7 | 1892.0 | 909.9 |
| | **Total Operating** | **2494.9** | **4413.9** | **4856.9** | **1716.5** |
| Advanced Projects (B1, G1) | BMA/BMC | 0.0 | 0.0 | 0.0 | 0.0 |
| | Other | 970.5 | 1994.6 | 1922.0 | 1367.2 |
| | **Total B1 and G1** | **970.5** | **1994.6** | **1922.0** | **1367.2** |
| Medium Term Projects (B2, G2) | BMA/BMC | 0.0 | 3659.4 | 1740.4 | 1359.0 |
| | Other | [redacted] | [redacted] | [redacted] | [redacted] |
| | **Total B2 and G2** | [redacted] | [redacted] | [redacted] | [redacted] |
| All operating & rank 1 and 2 Projects | BMA/BMC | 1702.8 | 6006.6 | 4705.4 | 4323.9 |
| | Other | [redacted] | [redacted] | [redacted] | [redacted] |
| | **Total** | [redacted] | [redacted] | [redacted] | [redacted] |
| Long Term Projects (B3, G3) | BMA/BMC | 0.0 | 35.0 | 0 | 16.0 |
| | Other | 0.0 | [redacted] | 0 | [redacted] |
| | **Total B3 and G3** | 0.0 | [redacted] | 0 | [redacted] |

## DBCT Coal Supply Forecast

Indicative Saleable Product supply from the catchment area will eventually decline, depending on the timing of mine closures, availability of new projects, port capacity and market demand for coal types within the Goonyella Rail System corridor. The predominance of metallurgical coal, and a positive forecast for metallurgical coal demand to at least 2060, suggests that supply is likely to continue until coal resources are depleted, and that there will be a steady stream of new projects being developed within the Goonyella Rail System corridor.

Coal supply to DBCT from some mines is likely to extend well beyond the depletion of coal resources in other mines/projects. For example, our scheduling of production from the Eagle Downs and New Lenton projects, indicates that their resource base would last beyond 2100, assuming quoted production rates of 3Mtpa and 1.2Mtpa respectively. This level of production would of course be insufficient to sustain DBCT function. The Method 2 scheduling methodology shows the rate of decline in coal supply as coal resources are depleted, and the point at which there may be insufficient supply to economically sustain DBCT function.

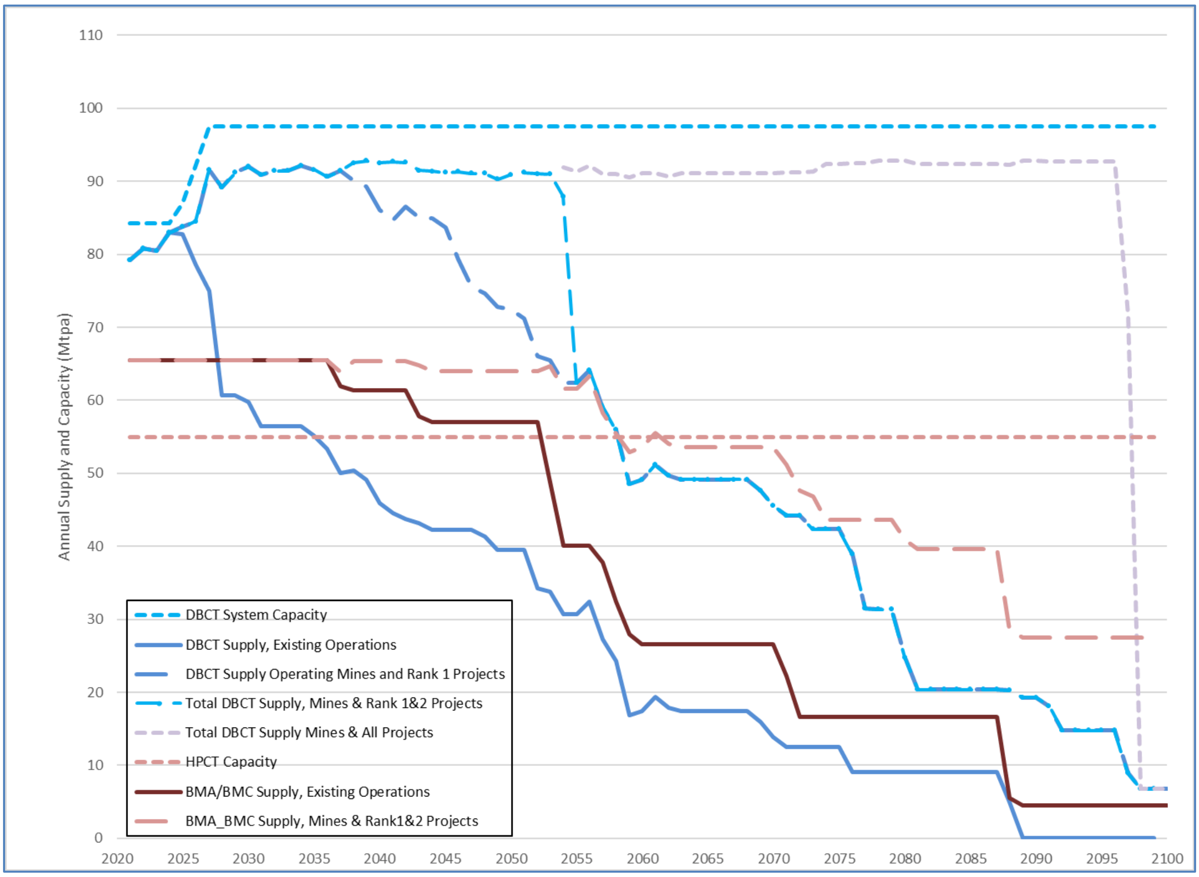
We have assumed that some projects such as Aquila, Ironbark No 1, Lake Vermont Meadowbrook, Olive Downs North, Isaac Downs, Isaac Plains Underground and Lake Elphinstone are likely to start as coal resources are depleted in nearby operating mines owned by the same company. Similarly, we have assumed that BMA projects such as Red Hill (underground and opencut), Saraji East and South Walker Creek, which are at an advanced stage of feasibility assessment, are likely to follow Goonyella/Riverside, Poitrel and South Walker Creek Opencut mines respectively, rather than being developed earlier.

Figure 6 presents our estimation of coal supply life to DBCT and HPCT using the Method 2 analysis, which is described in Section **Estimation of Catchment Coal Supply Life**. The following observations are made:

- Supply from existing operations supplying coal to DBCT, assuming about 13Mtpa HPCT surplus from BMC/BMA mines, starts to decline during the period from 2025 - 2027. This corresponds to depletion of publicly available Reserves at Moorvale Opencut, Grasstree underground, Coppabella opencut and Clermont opencut;
- There are several well advanced projects that are likely to not only replace this lost production, but support the proposed DBCT expansion to 97.5Mtpa starting in 2025;
- Subsequent supply to DBCT from existing operations and Rank 1 projects, including BMA/BMC surplus from HPCT, is expected to start declining from about 2037;
- supply to DBCT from existing operations and Rank 1 and 2 projects, including surplus from existing BMC/BMA operations, is expected to start declining from about 2053 (33 years from now);
- Supply from existing BMA/BMC mines and advanced projects declines to just below the capacity of HPCT (55Mtpa) at about 2058, from which time there is unlikely to be much BMA/BMC surplus to DBCT;
- Supply from existing BMA/BMC mines and advanced projects begins to decline below HPCT capacity in about 2070;
- Supply upside potential from Rank 3 projects may sustain supply to DBCT until beyond 2090, although there is a low level of certainty attached to this estimate.

RMI concludes that **there is likely to be sufficient saleable product supply from within the Goonyella Rail System corridor, including BMA/BMC supply that is surplus to HPCT capacity, to sustain DBCT at near capacity until at least 2053.** This assumes the positive metallurgical coal market outlook until about 2060, as discussed in Section **Review of Coal Market**.

Figure 6: Coal Supply to DBCT and HPCT Export Terminals




RMI notes that there is a significant quantity of Inferred Resources within the Goonyella Rail System corridor, comprising a total of [redacted] Mt for non-BMA/BMC mines and Rank 1 & 2 projects. While there is significant resource uncertainty associated with Inferred resources, this figure represents significant upside coal supply potential to DBCT. There is also considerable coal resource potential in the Rank 3 projects listed in Appendix B4, and within extensive exploration target areas currently held under exploration licences within the Goonyella Rail System corridor. Rank 3 projects are considered to have a reasonable probability of being developed in the long term if there is sustained metallurgical coal demand, while exploration targets may also provide additional upside potential.

RMI has not modified individual mine name plate capacity beyond 2053, including for example New Lenton and Eagle Downs as noted above, resulting in extended production well beyond the decline in DBCT supply. It would be reasonable to expect that projects like these would ramp up production rates, given available port capacity beyond 2053 and less competition. Increased production would consume more resources earlier, but marginally extend the supply life to DBCT at near DBCT capacity.

Further opportunities for increased resource supply potential are ongoing continuous improvements, new technologies and innovation including autonomous trucks, improved blasting systems, larger trucks and excavators, remote operation of underground longwall systems, improved underground ventilation and communication systems etc. These have provided significant improvements over the last 50 years, including increasing productivity per employee, and will continue to extend reserve limits in both underground and open cut mines. RMI has not included any reserve or resource extension as a result of innovation or new technology.

RMI therefore concludes that the supply life estimate of 33 years to about 2053 described above is conservative, and that there is likely to be significant upside DBCT coal supply potential well beyond that estimated to 2053, subject to further resource definition, improved mining methods and mine production rates, and sustained metallurgical coal demand.

## Comparison with the 2015 DAU Review

Table 7 and Table 8 compare Indicative Saleable Product and JORC Reserve and Resource estimates from this investigation with results from the 2015 review (RMI, 2015). We note current BMA operating mines and projects are the same as those assessed in 2015. The number of non-BMA operating mines has reduced, with several mines closing and some changing ownership. The number and nature of non-BMA projects has changed, with some 2015 projects shelved, several new projects and other projects that have advanced closer to development.

Table 7 shows that Indicative Saleable Product estimates have generally increased for operating mines and projects from the 2015 DAU review. Table 8 shows that Reserves have remained about the same for operating mines, while there has been a significant increase in JORC Measured and Indicated Resources for all operating mines. The comparison for non-BMA projects is complicated by differences in the number and nature of projects.

**Table 7: Comparison With the 2015 DAU Review**

| Category | Indicative Saleable Product (December 2014; Mt) | | | Indicative Saleable Product (December 2020; Mt) | | |
|---|---|---|---|---|---|---|
| | BMA/BMC | Other | Total | BMA/BMC | Other | Total |
| **Operating Mines** | 2721.0 | 1700.5 | 4421.5 | 2964.9 | 1892.9 | **4856.9** |
| **Rank 1 & 2 Projects** | 1715.7 | 2046.7 | 3762.4 | [redacted] | [redacted] | [redacted] |

RMI considers that these observations illustrate two important points for this investigation.

- The first is that most mining companies routinely undertake Reserves and some Resource definition ahead of mining, such that definition of new Reserves counterbalances Reserves depletion. Reserves therefore remain about the same.
- The second is that Coal Resource (and Reserves) definition tends to be cyclical, with higher exploration expenditure following periods of higher coal prices and market confidence. Coal exploration expenditure was relatively low prior to the 2015 DAU review, due to low coal prices at that time. Coal exploration expenditure increased with much higher coal prices

during the period from late 2016 to 2019 (BREE, 2020c), which explains the significant increase in Measured and Indicated Resources of operating mines within the Goonyella Rail System corridor since the 2015 DAU review.

Table 8 : JORC Reserves and Resources Comparison with 2015 DAU Review

| | Category | 2015 DAU (December 2014; Mt) | | | 2019 DAU (December 2020; Mt) | | |
|---|---|---|---|---|---|---|---|
| | | BMA/BMC | Other | Total | BMA/BMC | Other | Total |
| Operating Mines | JORC ROM Reserves | 2626 | 1471 | 4097 | 2608 | 1267 | 3875 |
| | JORC Measured & Indicated Resources | 1926 | 978 | 2904 | 2347 | 2067 | 4414 |
| Rank 1 & 2 Projects | JORC ROM Reserves | 0 | 547 | 547 | [redacted] | [redacted] | [redacted] |
| | JORC Measured & Indicated Resources | 3666 | 3756 | 7422 | [redacted] | [redacted] | [redacted] |

RMI considers that this largely explains the increase in Indicative Saleable Product estimates from the 2015 DAU review, despite about 650Mt having been mined from within the catchment area since that review. Conversely, Indicative Saleable Product estimates may decrease following periods of sustained low coal prices leading to a decrease in coal exploration activity and project advancement.

RMI concludes that a component of the Indicative Saleable Product estimate for operating mines is likely to remain constant, while resource potential exists ahead of mining, due to mines constantly refreshing Reserves estimation. However, the quantity of additional Measured & Indicated Resources may vary cyclically as exploration expenditure varies with prevailing sentiment. Project Reserves and Resources are also likely to vary cyclically, while undefined resource potential remains within the Goonyella Rail System corridor.

## Sensitivity of the Analysis

The analysis is sensitive to several factors, which have different impacts on supply life to DBCT, as follows:

- **Coal resource potential:** It is likely that current Reserves and Resources will be refreshed with further exploration and Reserve definition, as described above, while undefined coal resource potential remains within the catchment. Additionally, increases in reserves and resources will also be a function of ongoing innovation and operational improvements, extending previous limits to economic cut-offs. This means that supply life estimates will usually be conservative;
- **Metallurgical coal demand:** Our assessment assumes a positive outlook for metallurgical coal demand until at least 2060. A temporary reduction in demand may reduce mine production, but extend the life of catchment resources and DBCT supply life, assuming coal demand returns.

However, a sustained reduction in demand for metallurgical coal may ultimately reduce DBCT supply to unsustainable levels. RMI considers that this is unlikely to occur to a material extent before 2053. Although alternative steel making technologies could meet some demand, current evidence suggest they are unlikely to become commercially competitive to justify the capital to replace a large number of existing BOF furnaces, which are now under construction or approved for construction. If metallurgical coal demand continues beyond 2053, there is potential for the remaining suppliers to increase their mine name plate capacity to offset the reduction in supply from other mines and therefore extend the full utilisation of DBCT;

- **Thermal coal demand**: Our assessment assumes continued demand for the high quality low cost thermal coal supply from the Goonyella Rail System corridor in the short to medium term. Current evidence suggests alternative zero-carbon energy production technologies may start to become competitive before 2053. This may reduce Australian thermal coal exports, but is unlikely to materially impact coal supply to DBCT, as Rank 1 and 2 projects involve predominantly metallurgical coal;
- **Increased DBCT capacity**: The 9X DBCT capacity expansion to 135.7 Mtpa would result in a significant reduction in saleable product supply life to DBCT. For example, we estimate that DBCT supply would start to decline from 2045, rather than 2053, if DBCT capacity was increased to 135.7 Mtpa in about 2040, assuming current prospects for project development. This would represent a significant reduction in DBCT supply life.

# Appendices

## Appendix A: Australian Joint Ore Reserves Committee (JORC) Terminology

The Australian code for reporting of exploration results, mineral resources and ore reserves (JORC, 2012) is recognised as a mandatory basis for discussion of coal resources and reserves in Australia and worldwide. The following terms have been used in this report.

**Mineral Resource**: A mineral (coal) resource is a concentration or occurrence of solid material of economic interest, in such form, quality and quantity that there are reasonable prospects for eventual economic extraction. The location, quantity, quality, continuity and other geological characteristics of the resource are known, estimated or interpreted from geological evidence, including sampling. Mineral resources are classified and sub-divided in order of increasing geological confidence, into **Inferred**, **Indicated** and **Measures resources**

**Measured resource:** A Measured resource is that part of a mineral resource for which quantity, quality, densities, shape and physical characteristics are estimated with confidence sufficient to allow the application of **modifying factors** to support detailed mine planning and final evaluation of the **economic viability** of the resource. A Measured resource has been defined with a higher level of confidence than an Indicated resource, and may be converted to a **Proved Ore Reserve**.

**Indicated resource**: An Indicated resource is that part of a mineral resource for which quantity, quality, densities, shape and physical characteristics are estimated with confidence sufficient to allow the application of **modifying factors** to support detailed mine planning and final evaluation of the **economic viability** of the resource. An Indicated resource has been defined with a lower level of confidence than a Measured resource, and may only be converted to a **Probable Ore Reserve**.

**Inferred resource:** An Inferred resource is that part of a mineral resource for which quantity and quality are estimated from limited geological evidence and sampling. The geological evidence is sufficient to imply but not verify geological and grade continuity. An Inferred resource has been defined with a lower level of confidence than an Indicated resource, and **may not be converted to an Ore Reserve.** However, there is a sufficient level of confidence to expect that an Inferred resource could be upgraded to an Indicated resource with continued exploration.

**Ore Reserve**: Ore (Coal) Reserves are those portions of mineral resources that are economically mineable, which after the application of all material Modifying Factors result in an estimated tonnage and quality that can be the basis of a technically and economically viable mining project. Determination of **Modifying Factors** require Pre-Feasibility or Feasibility level studies to be undertaken to achieve the required level of confidence, which must include a mine plan or mine design.

**Modifying factors:** Modifying factors are adjustments required to a Measured and/or Indicated mineral resource estimate, which take account of dilution (contamination) and losses during mining, and yield, sizing and quality changes during processing. Modifying factors are determined from detailed Pre-feasibility and/or Feasibility level studies.

**Marketable Reserves:** Marketable (saleable) reserves are reported at the point of product delivery, after ore/coal processing, and include tonnage and quality adjustments from Run-of-Mine (ROM) reserves due to processing and yield modifying factors.

## Appendix B1: Currently Operational Mines, Goonyella Rail System corridor

| Operating Mine | Primary Owner | Mining method | Coal Type | Assumed Mining Recovery | Yield | Marketable Reserves, JORC (Dec 2020) | Additional Measured & Indicated Resources, JORC (Dec 2020) | 'Indicative Saleable Product' Dec 2020 | Additional Inferred Resources, JORC Dec 2020 |
|---|---|---|---|---|---|---|---|---|---|
| Capcoal Opencut Complex | Anglo American | opencut | met/thermal | 90% | 82.0% | 87.92 | 140.09 | 191.37 | 175.70 |
| Grasstree | Anglo American | longwall | Hard coking | 65% | 70.6% | 4.81 | 69.56 | 36.73 | 5.60 |
| Grosvenor | Anglo American | longwall | Hard coking | 65% | 61.6% | 76.42 | 239.46 | 172.30 | 68.10 |
| Moranbah Nth | Anglo American | longwall | Hard coking | 65% | 76.6% | 139.14 | 125.52 | 201.63 | 60.20 |
| Broadmeadow | BMA | longwall | Hard coking | 65% | 67.9% | 109.57 | 735.65 | 434.15 | 15.00 |
| Caval Ridge | BMA | opencut | Hard coking | 90% | 59.0% | 191.66 | 169.83 | 281.84 | 147.00 |
| Daunia | BMA | opencut | Met/PCI | 90% | 85.0% | 77.81 | 26.80 | 98.31 | 10.60 |
| Goonyella/Riverside | BMA | opencut | Met | 90% | 78.8% | 410.24 | 194.52 | 548.12 | 40.00 |
| Peak Downs | BMA | opencut | Met | 90% | 58.0% | 438.22 | 710.48 | 809.09 | 424.00 |
| Saraji | BMA | opencut | Met | 90% | 63.0% | 334.04 | 297.14 | 502.51 | 40.00 |
| Poitrel | BMC | opencut | Met | 90% | 79.0% | 41.94 | 33.99 | 66.10 | 59.00 |
| South Walker Creek | BMC | opencut | Met /PCI | 90% | 78.0% | 99.29 | 178.81 | 224.82 | 71.00 |
| Carborough Downs | Fitzroy Resources | underground | coking /PCI | 60% | 71.7% | 9.83 | 79.72 | 44.15 | 112.00 |
| Clermont | Glencore | opencut | Thermal | 90% | 100.0% | 77.61 | 0.00*1 | 77.61 | 5.00 |
| Hail Creek | Glencore | opencut | Met/thermal | 90% | 64.3% | 125.93 | 840.99 | 612.51 | 350.00 |
| Oaky North | Glencore | longwall | Met | 65% | 64.8% | 29.83 | 394.66 | 196.10 | 60.00 |
| Lake Vermont | Jellinbah Group | opencut | coking /PCI | 90% | 80.0% | 67.20 | 22.5*2 | 83.40 | 22.50 |
| Coppabella | Peabody | opencut | PCI | 90% | 77.0% | 21.36 | 0.00*3 | 21.36 | 0.00 |
| Middlemount | Peabody | opencut | PCI / coking | 90% | 76.0% | 41.86 | 54.09 | 77.26 | 3.93 |
| Moorvale O/C | Peabody | opencut | met /thermal | 90% | 80.0% | 7.30 | 0.00*3 | 7.30 | 0.00 |
| North Goonyella | Peabody | longwall | Hard coking | 65% | 82.0% | 33.6*4 | 0.00*3 | 67.24 | 0.00 |
| Foxleigh | Realm Resources | opencut | PCI | 90% | 70.5% | 43.38 | 36.06 | 66.27 | 31.90 |
| Isaac Plains Mine | Stanmore | opencut | semi-soft /thermal | 90% | 75.2% | 7.30 | 44.68 | 37.55 | 9.00 |
| Blair Athol | Terracom | opencut | thermal | 90% | 81.2% | 23.7 | 19.35 | 32.80 | 1.90 |
| | | | | | **Total BMA/BMC** | **1702.7** | **2347.2** | **2964.9** | 806.6 |
| | | | | | **Total DBCT** | **792.2** | **2066.7** | **1892.0** | 909.9 |
| | | | | | **Total All Operating Mines** | **2494.9** | **4413.9** | **4856.9** | 1716.5 |

*1 Glencore December 2019 reporting indicates nil additional Measured & Indicated Resources as at December 2020 after depletion.
*2 Lake Vermont Resource Statement unavailable; assumptions based on unclassified resources stated on current website, less Reserves.
*3 Peabody JORC Resource Estimates are unavailable.
*4 Reduced by 50%, due to assumed Reserve losses from underground fire.

## Appendix B2: Advanced (G1 and B1) Projects, Goonyella Rail System corridor

| Project | Primary Owner | Mining method | Coal Type | Mining Recovery | Yield | Marketable Reserves, JORC (Dec 2020) | Additional Measured & Indicated Resources, JORC (Dec 2020) | 'Indicative Saleable Product' Dec 2020 | Additional Inferred Resources, JORC Dec 2020 |
|---|---|---|---|---|---|---|---|---|---|
| Aquila - Capcoal | Anglo American | longwall | hard coking | 65.0% | 65.5% | 31.40 | 38.00 | 47.58 | 3.80 |
| Moranbah Sth | Anglo American | longwall | hard coking | 65.0% | 65.0% | 0.00 | 704.40 | 297.61 | 28.00 |
| Dysart East | Bengal Coal | underground | hard coking | 65.0% | 85.0% | 32.32 | 96.20 | 85.47 | 80.00 |
| Styx | Central Qld Coal | opencut | thermal /soft coking | 90.0% | 75.9% | 0.00 | 49.60 | 33.88 | 12.40 |
| Ironbark No 1 | Fitzroy Resources | underground | Semi hard coking /thermal | 65.0% | 86.2% | 70.70 | 15.85 | 79.58 | 290.00 |
| New Lenton | New Hope | opencut | PCI | 90.0% | 60.0% | 21.00 | 157.11 | 105.84 | 208.00 |
| Olive Downs Complex | Pembroke Resources | opencut | coking /PCI | 90.0% | 77.0% | 395.78 | 120.94 | 479.59 | 121.00 |
| Eagle Downs | South32 | longwall | hard coking /PCI | 65.0% | 62.3% | 182.00 | 509.77 | 388.53 | 183.00 |
| Isaac Downs | Stanmore Coal | opencut | semi-soft met | 90.0% | 69.1% | 17.90 | 7.42 | 22.52 | 0.00 |
| Isaac Plains Underground | Stanmore Coal | longwall | semi-soft met | 65.0% | 72.9% | 9.40 | 10.15 | 14.21 | 0.00 |
| Vulcan Mine Complex | Vitrinite Coal | opencut | hard coking | 90.0% | 100.0% | 0.00 | 9.00 | 8.10 | 6.00 |
| Winchester South | Whitehaven | opencut | coking /PCI /thermal | 90.0% | 60.0% | 210.00 | 276.11 | 359.10 | 435.00 |
| | | | **Total BMA/BMC** | | | **0** | **0** | **0** | **0** |
| | | | **Total DBCT** | | | **970.5** | **1994.6** | **1922.0** | **1367.2** |
| | | | **Total All Rank 1 projects** | | | **970.5** | **1994.5** | **1922.0** | **1367.2** |

## Appendix B3: Medium Term (G2 and B2) Projects, Goonyella Rail System corridor

| Project | Primary Owner | Mining method | Coal Type | Mining Recovery | Yield | Marketable Reserves, JORC (Dec 2020) | Additional Measured & Indicated Resources, JORC (Dec 2020) | 'Indicative Saleable Product' Dec 2020 | Additional Inferred Resources, JORC Dec 2020 |
|---|---|---|---|---|---|---|---|---|---|
| Bee Creek - BMA | BMA | opencut | PCI /thermal | 90.0% | 65.0% | 0.0 | 9.40 | 5.50 | 13.00 |
| Norwich Park - U/G | BMA | longwall | Coking | 65.0% | 71.0% | 0.0 | 20.00 | 9.23 | 22.00 |
| Red Hill - BMA_O/C | BMA | opencut | Met | 90.0% | 78.8% | 0.0 | 25.00 | 17.72 | 0.00 |
| Red Hill - BMA_U/G | BMA | longwall | Met | 65.0% | 67.9% | 0.0 | 1123.00 | 495.48 | 563.00 |
| Saraji East | BMA | opencut | Met | 90.0% | 63.0% | 0.0 | 1134.00 | 642.98 | 504.00 |
| Wards Well | BMA | longwall | Met | 65.0% | 65.0% | 0.0 | 1158.00 | 489.26 | 149.00 |
| South Walker Creek U/G | BMC | longwall | Met/PCI | 65.0% | 65.0% | 0.0 | 190.00 | 80.28 | 108.00 |
| Lake Vermont Meadowbrook | Bowen Basin Coal (Jellinbah Group) | longwall | coking /PCI | 65.0% | 78.6% | 0.0 | 120.00 *1 | 61.29 | 280.00 |
| Broadmeadow East O/C | Bowen Coking Coal | opencut | met /thermal | 90.0% | 60.0% | 0.0 | 8.40 *1 | 4.54 | 26.00 |
| Moorlands | Cuesta Coal | opencut | thermal | 90.0% | 89.9% | 0.0 | 241.80 | 195.64 | 76.20 |
| Lake Elphinstone | Glencore | opencut | thermal | 90.0% | 65.0% | 0.0 | 120.00 | 70.20 | 40.00 |
| Codrilla | Peabody | opencut | PCI | 90.0% | 80.0% | [redacted] | [redacted] | [redacted] | [redacted] |
| Olive Downs North | Peabody | Opencut | coking/PCI | 90.0% | 77.0% | [redacted] | [redacted] | [redacted] | [redacted] |
| Hillalong - QCE | Shandong Energy | opencut | semi-hard coking | 90.0% | 64.6% | 0 | 39.4 | 22.91 | 123.2 |
| | | | **Total BMA/BMC rank 2 projects** | | | **0** | **3659.4** | **1740.4** | **1359.0** |
| | | | **Total DBCT rank 2 projects** | | | [redacted] | [redacted] | [redacted] | [redacted] |
| | | | **Total All rank 2 projects** | | | [redacted] | [redacted] | [redacted] | [redacted] |

*1 Web-site estimates, with no associated JORC Resources statement available
*2 Based on confidential Peabody JORC Reserves and Resources.

## Appendix B4: Long Term Projects (B3 and G3)

| Mine or Project | Primary Owner | Mining method | Coal Type | Measured & Indicated Resources, JORC (Dec 2020) | Additional Inferred Resources, JORC Dec 2020 |
|---|---|---|---|---|---|
| Talwood | Aquila Resources | underground | coking | 185.50 | 249.40 |
| Picardy | BMA | opencut | met | 0.00*2 | 0.00*2 |
| Saraji East U/G | BMA | longwall | Met | 35.00 | 16.00 |
| Broadmeadow East U/G | Bowen Coking Coal | underground | met/thermal | 2.30 | 20.00 |
| Hillalong - BCC | Bowen Coking Coal | opencut | PCI | 13.10 | 6.40 |
| Hillalong BCC U/G | Bowen Coking Coal | underground | PCI | 7.70 | 15.90 |
| Isaac River O/C | Bowen Coking Coal | opencut | coking /PCI | 5.69 | 0.00 |
| Isaac River U/G | Bowen Coking Coal | underground | coking/PCI | 2.60 | 0.40 |
| Red Hill - Fitzroy | Fitzroy Resources | opencut | Coking /PCI | 0.00*2 | 0.00*2 |
| Fairhill Oaky Creek | Glencore | opencut | thermal | 45.00 | 20.00 |
| Hail Creek U/G | Glencore | longwall | Coking /thermal | 0.00 | 70.00 |
| Red Rock | Glencore | opencut | met /thermal | 211.00 | 140.00 |
| Bee Ck – New Hope | New Hope | Opencut | PCI /thermal | 0.00*2 | 0.00*2 |
| Gundyer | Peabody | longwall | coking /PCI | [redacted] | [redacted] |
| Moorvale North & South | Peabody | opencut | coking /PCI | [redacted] | [redacted] |
| Mungara and Mulgrave | Peabody | opencut | Met /PCI | [redacted] | [redacted] |
| Vermont East | Peabody | opencut | met/thermal | [redacted] | [redacted] |
| West Burton | Peabody | underground | hard coking | [redacted] | [redacted] |
| Codrilla South | Peabody | opencut | PCI | [redacted] | [redacted] |
| Codrilla North | Peabody | underground | PCI | [redacted] | [redacted] |
| Diamond Creek | Q Coal Pty | opencut | thermal | 0.00 | Exploration target |
| Grosvenor West | Qingkai Kingho Group | opencut | coking /thermal | 108.90 | 32.00 |
| Suttor | Qld Coal Investments | opencut | thermal | 0.00*2 | 0.00*2 |
| Richfield | Shandong Energy | opencut | coking /thermal | 0.00*2 | 0.00*2 |
| Isaac South | Stanmore Coal | opencut | semi-soft met /thermal | 26.40 | 25.00 |
| Broughton | U&D Mining | opencut | met /thermal | 28.90 | 92.00 |
| Rockwood | U&D Mining | opencut | anthracite /PCI | 47.10 | 400.00 |
| Denham Park | Vitrinite Coal | opencut | hard coking | 0.00*2 | 0.00*2 |
| Karin Basin | Vitrinite Coal | opencut | coking | 0.00 | 123.00 |
| Harrybrandt | Yancoal | opencut | Anthracite /PCI | 0.00 | 102.50 |
| | **Total B3 and G3 Projects** | | | [redacted] | [redacted] |

*1 Based on confidential Peabody JORC estimates
*2 Resource estimates are unavailable

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