ECONOMIC LIFE OF DBCT ASSETS

A Confidential Report prepared by Energy Economics for the Queensland Competition Authority

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1. INTRODUCTION

In February 2005, the Queensland Competition Authority engaged Energy Economics to provide an independent review of the economic life of the Dalrymple Bay Coal Terminal (DBCT), focusing on the known coal resources within the catchment area of the terminal. The Authority provided for review a copy of a report titled 'Useful Life of DBCT Assets' prepared by Barlow Jonker Pty Ltd in December 2004 for Prime Infrastructure Pty Ltd.

The Queensland Competition Authority instructed Energy Economics to:

1. undertake an independent review of the economic life of the DBCT, including BMA reserves and reasonable assumptions on coal extraction and handling rates at the Dalrymple Bay and Hay Point terminals; and
2. provide a critique of the Barlow Jonker report, including identifying and explaining any differences between the Energy Economics and Barlow Jonker reports.

In undertaking this task, Energy Economics was required to:

1. assess the coal reserves in the Hay Point catchment area, including an assessment of:

    a) the boundary of the catchment area;
    b) the economically recoverable coal reserves in that catchment area by:
        i) non-BMA coal;
        ii) BMA coal; and
    c) Any other relevant matter.

2. provide an assessment of the economic life of DBCT based on the coal reserves identified in 1. and on a number of reasonable assumptions of extraction and terminal handling rates, including:

    a) Energy Economics forecasts of the most likely extraction and handling rates at Dalrymple Bay and Hay Point terminals;
    b) Repeat 2(a) but subject to a combined constraint of 120 mtpa; and
    c) A sensitivity analysis of 2(b) based on a number of possible combinations of terminal handling rates.

2. EXECUTIVE SUMMARY

Energy Economics has reviewed the Barlow Jonker report titled 'Useful Life of DBCT Assets' and finds it to be a professionally prepared and, in the main, factually correct report.

Energy Economics has independently compiled the measured and indicated coal resources of the Port of Hay Point catchment area from published sources. These resources total 11.16 billion tonnes, of which 6.60 billion tonnes are in tenements controlled by BHP Billiton and its partners, and 4.56 billion tonnes are within tenements held by other mining companies and exploration companies. The later figure is substantially lower than the 5.81 billion tonnes total reported in the Barlow Jonker report. There are two main reasons for this discrepancy.

1. Rio Tinto has substantially downgraded the coal resources at its Hail Creek mine since the source of the Barlow Jonker data, 'Queensland Coals', was published in 2003.
2. Barlow Jonker, for reasons unknown, included three resource areas controlled by BHP Billiton in their tabulation of resources areas for the DBCT: - Daunia, Wards Well and Liskeard.

Both the Dalrymple Bay coal Terminal and the Hay Point Coal Terminal at the Port of Hay Point are currently undergoing capacity expansions: to 60 Mtpy and 40 Mtpy respectively. There are various options under consideration for further capacity expansions at the two terminals, as discussed in chapter three of this report. Under the most likely expansion scenario the combined capacity of the two terminals would be increased to a combined 126 Mtpy by 2008, comprised of 75 Mtpy at the Dalrymple Bay Coal Terminal and 51 Mtpy at the Hay Point Coal Terminal.

The factors used by Barlow Jonker to convert measured and indicated coal resources to an indicative inventory of 'saleable' coal are considered to be appropriate and have, in the main, been adopted and used in the calculations in this report. Using these factors, the Dalrymple Bay Coal Terminal has an indicative life of ***32 years*** based on:

- Current reported measured and indicated coal resources of non- BHP Billiton mines in the catchment area of 4.56 billion tonnes, which through application of appropriate factors converts to an indicative inventory of 'saleable' coal of 2.22 billion tonnes.
- Expansion of the capacity of the terminal to 75 Mtpy in 2007.
- Assumed throughput via DBCT of 5 Mtpy of coal from BHP Billiton controlled mines.

BHP Billiton and its partners control more of the coal resources in the port catchment area than all other companies combined. Hence the Hay Point Coal Terminal has a significantly longer life of ***46 years*** based on:

- Current reported measured and indicated coal resources of BHP Billiton mines in the catchment area of 6.60 billion tonnes, which through application of appropriate factors converts to an indicative inventory of 'saleable' coal of 2.56 billion tonnes.
- Capacity expansion to 51 Mtpy in late 2007 or 2008.
- Ongoing throughput via DBCT of 5 Mtpy of coal from BHP Billiton controlled mines.

Viewed as a single entity, the catchment area of the Port of Hay Point contains 11.16 billion tonnes of measured and indicated coal resources, which converts to an indicative inventory of 'saleable' coal of 4.77 billion tonnes. At the likely ultimate capacity of the port of 126 Mtpy, outlined above, the indicative inventory of 4.77 billion tonnes of 'saleable' coal is sufficient for an operational life for the Port of Hay Point of ***38 years***.

The above computations are based solely on the known measured and indicated coal resources within the study area, as are the similar computations in the Barlow Jonker report. There are reasonable justifications for taking this approach.

1. Firstly there is a practical reason. The available data for resources outside of the measured and indicated categories is limited.
2. The second reason relates to the degree of knowledge of the resource. Resources can only be categorised as measured and indicated when they have been well explored and the geological continuity of the deposit can be ascertained with reasonable certainty.

It is important to note that there is a third category of resources, inferred, for those deposits that are insufficiently well explored to be categorised as measured or indicated. Further, there known occurrences of coal that are insufficiently well explored to be included in any of the resource categories. There is intensive exploration activity currently being undertaken within the study area by numerous mining and exploration companies, including all four of the major international mining companies. These companies obviously believe that there is significant potential to identify additional deposits of economically extractable coal in the area, or extensions to existing deposits. It is almost certain therefore that coal deposits will be developed in future in addition to those with currently defined measured and indicated reserves. The economic lives of the coal terminals at the Port of Hay Point are likely to be greatly extended by this ongoing exploration activity, to well beyond the life determined from the existing measured and indicated resources.

Just how long the economic life of the port assets will be extended by ongoing exploration is a matter of pure speculation, even to those with a sound knowledge of the geology and mining projects of the study area. Much will depend on the future performance of longwall mining in the study area, as substantial un-mined coal deposits exist at depth, down dip from current operations. The historical performance of longwall mining in the Moranbah Coal Measures has been poor, due to high horizontal stress levels and the presence of thrust faults, however the current FOB production costs of coking coal producers in the catchment area are substantially lower than those of major competitors in Canada and the United States, so the viability of mining in the study area can be maintained even if average production costs increase significantly. It can be speculated, therefore, that mining in the port catchment area will continue unabated for at least 50 years, and possibly well beyond 100 years.

Barlow Jonker makes the valid point that “The return of capital from the DBCT assets should not be contingent on the discovery of resources which are currently unknown or are currently not economically viable as this would require investors in the DBCT infrastructure assets to assume exploration and/or resource development risk” Furthermore, Energy Economics agrees with Barlow Jonker that there are significant long term risks to future port throughput posed by new technology in the steel industry, legislation to limit greenhouse gas emissions, and the potential loss of tonnage to the Port of Abbot Point if current moves to link the Goonyella and Newlands rail systems come to fruition.

Although the available data is insufficient to define, in absolute terms, the life of the coal inventory of the DBCT catchment area the catchment area, Energy Economics considers the risk of structural decline in coal exports via DBCT occurring within a 50 year time frame is small. Beyond this time frame the potential risks, both in terms of potential sources of coal supply to the port and demand for coal in international markets, increase considerably. **Energy Economics therefore recommends the Authority adopt an economic life for the Dalrymple Bay coal terminal of 50 years.**

3. THE PORT OF HAY POINT

The coal handling facilities at the Port of Hay Point comprise two terminals located adjacent to each other: the Dalrymple Bay Coal Terminal (DBCT) and the Hay Point Coal Terminal (HPCT).

3.1. Dalrymple Bay Coal Terminal

Current Capacity:	53.2 Mtpy	
Current Expansion:	60 Mtpy	(January 2006)
Future Expansion Plan:	68 Mtpy	(January 2007)
Future Expansion Plan:	75 or 80 Mtpy	(June/July 2007)

Prime Infrastructure Pty Ltd holds DBCT under long-term lease from the Queensland government. The Stage 6 DBCT expansion, which was completed in June 2003, was originally assigned a rated coal throughput capacity of 55.5 Mtpy. However the operating capacity was revised upwards to 56 Mtpy following a recalibration of the Terminal Capacity Model. On 15 February 2004, a reclaimer (RL1) collapsed and was damaged beyond repair, restricting port throughput to around 70% of capacity over the following seven weeks. The terminal was restored to 95% of capacity (53.2 Mt) on 5 April 2004, which remains the nominal capacity of the terminal at the present time. A replacement for the damaged reclaimer is scheduled to be commissioned in January 2006. The replacement reclaimer will have a higher throughput capacity than the damaged RL1 reclaimer, and its commissioning in January 2006 will result in the capacity of DBCT increasing from 53.2 Mtpy to 60 Mtpy.

Prime Infrastructure has investigated numerous expansion options to further increase capacity to levels ranging from 72 Mtpy up to 90.5 Mtpy, but it is understood that recent planning has focused on two expansion options, one to 75 Mtpy and the other to 80 Mtpy. The main difference between the two options is that the 80 Mtpy option would include construction of a fourth berth at the terminal. Under either option full commissioning would be completed by June or July 2007, with capacity under either option increasing in the interim from 60 Mtpy to 68 Mtpy by the end of 2006 or early 2007.

3.2. Hay Point Coal Terminal

Current Capacity:	35 Mtpy	
Current Expansion:	40 Mtpy	(July 2006)
Future Expansion Plan:	51 Mtpy	(Late 2007?)

The BHP Billiton Mitsubishi Alliance (BMA) is currently expanding the capacity of the Hay Point Coal Terminal from around 35 Mtpy to 40 Mtpy. This expansion is on-schedule to be commissioned in July 2006.

It is understood that there is little capability for further capacity expansion unless a third berth is constructed. The BMA is actively considering the construction of a third berth, with a third shiploader, which would take capacity up to 51 Mtpy. The BMA schedule for this expansion is not known. Energy Economics' forecasts of future production levels of BHP Billiton controlled mines, summarised in section 3.5 below, indicate that the expansion would need to be in place by late 2007 or early 2008.

3.3. Exports From BHP Billiton Mines Via DBCT

Most coal produced from mines controlled by BHP Billiton, and located within the port catchment area, is exported via the HPCT. The lesser tonnages of BHP Billiton coal that have been historically exported via the DBCT are estimated as 1.7 Mtpy, as tabulated below.

ESTIMATE OF EXPORTS FROM BHPB CONTROLLED MINES VIA DBCT (2003)

Mt

Mine Name	Main Terminals	Owner	Export Sales
Crinum	Hay Point & RG Tanna	BHP Billiton Mitsubishi Alliance	3.76
Goonyella O/C	Hay Point	BHP Billiton Mitsubishi Alliance	7.97
Goonyella U/G (Broadmeadow)	Hay Point	BHP Billiton Mitsubishi Alliance	-
Gregory O/C	Hay Point & RG Tanna	BHP Billiton Mitsubishi Alliance	1.39
Norwich Park	Hay Point	BHP Billiton Mitsubishi Alliance	4.62
Peak Downs	Hay Point	BHP Billiton Mitsubishi Alliance	8.45
Riverside	Hay Point & DBCT	BHP Mitsui Coal	3.18
Saraji	Hay Point	BHP Billiton Mitsubishi Alliance	5.78
South Walker Creek	Hay Point & DBCT	BHP Mitsui Coal	3.86
Total			39.01
Minus Gregory/Crinum Exports via Gladstone (approx.)			-2.30
Minus Hay Point Coal Terminal Throughput			-35.04
Indicative BHPB Exports Via DBCT			**1.7**

In 2004, BHP Billiton announced that it had reached agreement with Prime Infrastructure to secure an additional 3 Mtpy of DBCT throughput entitlement. Therefore BHP Billiton now has total DBCT throughput entitlement of some ***5 Mtpy***.

It is understood that there have been no subsequent discussion between BHP Billiton and Prime Infrastructures regarding further increments in BHP Billiton's DBCT throughput entitlement beyond 5 Mtpy. At this stage it seems that BHP Billiton is focused on securing its future incremental port terminal throughput requirements through expansion of the capacity of the HPCT.

Energy Economics is not privy to the duration of the DBCT throughput entitlement contracts between BHP Billiton and Prime Infrastructure, but typically such agreements have a long duration. It therefore appears likely that exports of coal from BHP Billiton controlled mines will be about 5 Mtpy for the remainder of this decade.

3.4. Catchment Area

The mine catchment area for the Port of Hay Point is defined for the purposes of this report as follows.

- *Northern Boundary*: A line running from approximately 15 km north of the Hail Creek deposit in the east, extending westward to bisect the Lancewood and Wards Well mining leases.

- *Southern Boundary*: A line running from midway between the Yarrabee mine and the Lake Lindsay deposit in the east, extending westward through the Gregory mining lease.

These boundaries include all mines that currently export coal via the port of Hay Point, while excluding all mines that export via other ports. The northern boundary's bisection of the undeveloped Lancewood and Wards Well mining leases is somewhat arbitrary – these two areas could end up being developed as a single underground mining complex, and could export via either the Port of Hay Point or the Port of Abbot Point. The Valeria project, which could potentially export via either DBCT or Gladstone, has been excluded from the study area.

Deposits outside of the Bowen Basin, in the Styx and Galilee Basins, have been excluded from the study area. The Styx Basin, located on the coast midway between Mackay and Rockhampton, has insignificant reported coal resources. The inland Galilee Basin is a potential long-term source of coal supply to DBCT, with significant measured and indicated coal resources reported at three deposits: Pentland, Alpha and Kevin's Corner. But rail haul distances to port would be double that of most existing Bowen Basin mines. The northernmost of the three identified deposits in the Galilee Basin, Pentland, would use the Port of Abbot Point if developed. The two southern projects, Alpha and Kevin's Corner, would most likely export via Gladstone, although transport via Blair Athol to DBCT could be another potential option.

3.5. Forecast Coal Supply And Terminal Capacity Scenarios

Energy Economics has evaluated likely coal mine expansions, closures and developments in the study area and concludes that potential coal exports via the Port of Hay Point could increase to 118 Mt by 2010 and continue to grow over the following five years, as tabulated below.

INDICATIVE FORECAST OF COAL EXPORTS VIA THE PORT OF HAY POINT

Mt

	2005	2006	2007	2008	2009	2010	2015
Total	**88**	**97**	**104**	**111**	**113**	**118**	133
- BHPB Mines	38	42	44	48	53	57	62
- Other Mines	50	55	60	63	60	60	71
BHPB via DBCT (Indicative)	3.00	5.00	5.00	5.00	5.00	5.00	5.00
DBCT	**53**	**60**	**65**	**68**	**65**	**65**	**76**
HPCT	**35**	**37**	**39**	**43**	**48**	**52**	**57**

The capacity of the port is currently being expanded to 100 Mtpy: 60 Mtpy at DBCT and 40 Mtpy at Hay Point. It is highly likely that this additional terminal capacity will be fully utilised as soon as it is commissioned, and that further expansions will need to be initiated within the short term.

Energy Economics' forecasts indicate that expansion of DBCT to 75 Mtpy would be more than adequate to cater for medium term supply of coal from the non-BHP Billiton mines, plus 5 Mtpy of BHP Billiton coal, although it is noted that the mining companies own forecasts are more bullish than those tabulated above. In this regard much will depend on how long the current surge in metallurgical coal demand is sustained.

The forecasts tabulated above also indicate that the proposed expansion of the HPCT will need to be in place by the end of 2007, as discussed earlier.

It is Energy Economics opinion that ***the most likely scenario for the medium term development of the port is that the DBCT will be expanded to 75 Mtpy and the HPCT will be expanded to 51 Mtpy, giving a total port coal handling capacity of 126 Mtpy by 2008***.

According to the coal supply forecasts tabulated on the previous page this would swing the port from the under-capacity this year to 15 Mtpy of over-capacity in 2008. The reason for this is in part a practical one, with the next HPCT expansion requiring the construction of a third berth. This by its nature provides a large tranche of additional capacity at one time. The spare capacity at the HPCT is likely to be rapidly taken up: by around 2010. The spare capacity at DBCT from mid 2007 through to beyond 2010 may be illusory if the mining companies more bullish production forecasts are correct. Nevertheless, it is possible that Prime Infrastructure may need to move back to the discarded 72 Mtpy 'Incremental' expansion plan if mine development plans are delayed.

The 126 Mtpy future capacity of the port, discussed above, could be its ultimate capacity for two main reasons. The first is the subject of this report – concerns about the long-term sustainable supply of coal to the port. The second reason is a limitation in the underlying capacity of the Goonyella rail system that services the port. According to the Queensland Resources Council, Queensland Rail "has also determined that capacity on this corridor could be further augmented from the current 90Mt to 120Mt (with some recent reports suggesting this could be as high as 140Mt) at which point it could be effectively capped by geographical constraints. Beyond this, major construction works would be required which are likely to involve triplication of the line at Black Mountain which may present practical problems."

This rail capacity constraint could lead to the construction of the 'missing link', connecting the Goonyella rail system with the Newlands rail system so that further incremental growth in mine supply in the study area could be catered for by railings northward to the Port of Abbot Point. There has been strong renewed interest in the 'missing link' project over recent times.

Following from the above discussion, three scenarios have been adopted for this report as tabulated below, including a 120 Mtpy option as required by the Queensland Competition Authority brief.

PORT OF HAY POINT COAL TERMINAL CAPACITY EXPANSION SCENARIOS

Mtpy

	Current Expansion	Future Option 1 (QCA)	Future Option 2
Dalrymple Bay Coal Terminal	60		75
Hay Point Coal Terminal	40		51
Total	**100**	**120**	**126**

4. COAL RESOURCES OVERVIEW

In its evaluation of the coal resources in the Hay Point catchment area Barlow Jonker limits its analysis to those reported resources in the measured and indicated categories. There are reasonable justifications for taking this approach.

3. Firstly there is a practical reason. The available data for resources outside of the measured and indicated categories is limited. The most comprehensive source of resource data for the study area is provided by the Queensland Department of Natural Resources and Mines in the 14th edition its publication 'Queensland Coals', published in 2003. The Queensland Department of Natural Resources and Mines has access to data that is not readily available in the public domain. Barlow Jonker has used this publication exclusively as the source of its resource figures. 'Queensland Coals' reports only measured and indicated resources.
4. The second reason relates to the degree of knowledge of the resource. Resources can only be categorised as measured and indicated when they have been well explored and the geological continuity of the deposit can be ascertained with reasonable certainty.

However there is a third category of resources, inferred, for those deposits that are insufficiently well explored to be categorised as measured or indicated. Further, there known occurrences of coal which are insufficiently well explored to be included in any of the three resource categories. Mining industry personnel reading the Barlow Jonker report would be aware that its analysis was limited to the best explored subset of the known coal occurrences in the study area. However, those not so intimately involved in the mining industry would likely gain the impression that coal occurrences in the study area were limited to the measured and indicated resources discussed by Barlow Jonker. This is not the case. For those without a working knowledge of the resources and reserves codes a summary is provided in sections 4.1 and 4.2 overleaf.

Barlow Jonker makes the valid point that "The return of capital from the DBCT assets should not be contingent on the discovery of resources which are currently unknown or are currently not economically viable as this would require investors in the DBCT infrastructure assets to assume exploration and/or resource development risk" But is important for those outside the mining fraternity to note that Barlow Jonker has not stated in its report that coal in the study area will be exhausted in 50 years, rather it implies that there is a risk that the 'project pipeline' could dry up in around that time frame.

Barlow Jonker further states "The Bowen Basin is a well explored region, and it is likely that the majority of coal resources in the DBCT catchment area have already been discovered" While Energy Economics is in general agreement with this statement, a lot hinges on the words 'likely' and 'majority'. There is intensive exploration activity currently being undertaken within the study area by numerous mining and exploration companies, including all four of the major international mining companies. These companies obviously believe that there is significant potential to identify additional deposits of economically extractable coal, or extensions to existing deposits, within the study area. Indeed coal exploration activity in Queensland is so intense that a shortage of experienced drilling personnel has developed. There are some 100 Exploration Permits for Coal (EPC's) in force or under application in the study area, which are listed in chapters five and six of this report. It is extremely likely that ongoing exploration will result in the development of new coal mines, additional to those deposits considered in the Barlow Jonker report.

4.1. Coal Resources and Reserves Categories

Australian standards for the public reporting of mineral resources and reserves, including coal, are set by the *Joint Ore Reserves Committee* (JORC) of The Australasian Institute of Mining and Metallurgy, the Australian Institute of Geoscientists and the Minerals Council of Australia.

Guidelines similar to JORC, with only minor regional variations, have been adopted in South Africa, Canada, US, UK, Ireland and Europe and together these represent current best practice for reporting Ore Reserves and Mineral Resources.

4.1.1. Resources

The JORC code states that a 'Mineral Resource' is a concentration or occurrence of material of intrinsic economic interest in such form, quality and quantity that there are *reasonable prospects for eventual economic extraction.* Mineral Resources are sub-divided, in order of increasing geological confidence, into Inferred, Indicated and Measured categories.

An 'Inferred Mineral Resource' is that part of a Mineral Resource for which tonnage, grade and mineral content can be estimated with a low level of confidence. It is inferred from geological evidence and geological and/or grade continuity is assumed but not verified. Inferred Coal Resources may be estimated using data obtained from Points of Observation up to 4 kilometres apart.

An 'Indicated Mineral Resource' is that part of a Mineral Resource for which tonnage, densities, shape, physical characteristics, grade and mineral content can be estimated with a reasonable level of confidence. The sampling locations are too widely or inappropriately spaced to confirm geological and/or grade continuity but are spaced closely enough for continuity to be assumed. Indicated Coal Resources may be estimated using data obtained from Points of Observation normally less than 1 kilometre apart.

A 'Measured Mineral Resource' is that part of a Mineral Resource for which tonnage, densities, shape, physical characteristics, grade and mineral content can be estimated with a high level of confidence. The sampling locations are spaced closely enough to confirm geological and grade continuity. Measured Coal Resources may be estimated using data obtained from Points of Observation normally less than 500 metres apart.

It can be seen from the above definitions that substantial additional expenditure is required to boost the resource category of a coal deposit. Where four drill holes are sufficient to define an inferred resource, 16 would be required for an indicated resource and 64 for a measured resource. **Mining and exploration companies will generally not undertake such exploration expenditure until they consider that mining of the deposit likely within the short to medium term; not when the deposit is unlikely to be mined for decades. Hence, when undertaking an exercise such as defining the economic life of an asset like DBCT, the available data is usually insufficient to provide an analysis with any great level of certainty.** Calculation of a precise economic life based on a definitive inventory of coal is not possible. Definition of such coal inventory life is therefore highly subjective even for those with a good knowledge of the geology of the study area.

4.1.2. Reserves

This report only briefly discusses coal reserves, but brief definitions are included here for the sake of completeness. The JORC code states "An 'Ore Reserve' is the *economically mineable part of a Measured and/or Indicated Mineral Resource*. It includes diluting materials and allowances for losses, which may occur when the material is mined. Appropriate assessments and studies have been carried out, and include consideration of and modification by realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors. These assessments demonstrate at the time of reporting that extraction could reasonably be justified. Ore Reserves are sub-divided in order of increasing confidence into Probable Ore Reserves and Proved Ore Reserves.

A 'Probable Ore Reserve' is the economically mineable part of an Indicated, and in some circumstances, a Measured Mineral Resource.

A 'Proved Ore Reserve' is the economically mineable part of a Measured Mineral Resource.

5. COAL RESOURCES OF THE DBCT CATCHMENT

As noted previously, Barlow Jonker used the Queensland Department of Natural Resources and Mines publication 'Queensland Coals' as the sole source of data for its coal resource tabulations. Energy Economics has updated some of the resource estimates from company publications. Updated resources are only available from Rio Tinto and some of the smaller mining companies. Neither Xstrata nor Anglo American provide any meaningful breakdown of coal reserves or resources in their annual reports, although Xstrata is expected to initiate reporting of detailed reserves shortly.

Despite the relatively small proportion of mine and project resource figures that have been updated, Energy Economics' calculated sum of measured and indicated reserves for non BHPB controlled mines within the study area is substantially lower than that presented in the Barlow Jonker report. ***Energy Economics' total is 4.6 billion tonnes, compared with Barlow Jonker's total of 5.8 billion tonnes***. There are two main reasons for this discrepancy.

3. Rio Tinto has substantially downgraded the coal resources at its Hail Creek mine since 'Queensland Coals' was published in 2003. Measured and indicated resources have been reduced from 970 Mt to 476 Mt, a reduction of close to ***half a billion tonnes***.
4. Barlow Jonker erroneously included three resource areas controlled by BHP Billiton in their tabulation of resources areas in the DBCT catchment area: - Daunia, Wards Well and Liskeard. This resulted in the Barlow Jonker total being ***0.725 billion*** tonnes higher than it should have been. On the other hand, Barlow Jonker excluded from its tabulation the 20 Mt Broadmeadow/Wallanbah coal resource, which is part of Peabody Energy's Burton mine, perhaps confusing it with the BMA's Broadmeadow punch longwall mine at Goonyella.

Other relatively minor differences include resource depletion by mining, partly counterbalanced by the inclusion of recently released resources for the Isaac Plains opencast project, which is owned by AMCI and Aquila Resources. Energy Economics has also reduced the resources for the Oaky Creek mining complex by an appropriate proportion, taking into account that this complex exports via the Port of Gladstone as well as the Port of Hay Point.

The factors used by Barlow Jonker to convert measured and indicated resources to indicative saleable 'reserves' are considered to be appropriate and have been replicated in the calculations in this report. The resultant indicative saleable 'reserves' are 2.2 billion tonnes, as tabulated overleaf, which is substantially below the Barlow Jonker figure of 2.8 billion tonnes due to the differences at the resource level discussed above. Under a scenario where 5 Mtpy of coal from BHPB mines is handled at DBCT on an ongoing basis, as discussed in section 3.3, the figure of 2.2 billion tonnes is sufficient for continued supply to DBCT for 40 years at the 60 Mtpy capacity to which the terminal is currently being expanded (2,200 Mt / (60 - 5 Mtpy)). Under the scenario considered most likely, which envisages DBCT expanding to 75 Mtpy, the life of the estimated inventory of saleable coal reduces to **32 years**, again assuming 5 Mtpy of coal from BHPB mines is handled at DBCT. **These figures exclude potential additional coal supply from resource areas currently categorised as inferred, and the discovery of additional coal resources in the study area.** This likelihood was discussed in general in chapter four. Specifically, the high level of exploration level in the study area is likely to provide additional coal resources over the short to medium term. The Carborough Downs project area being explored by AMCI is understood to contain some 200 Mt of coal resources. AMCI is also exploring the nearby Broadlea opencast project. Overall there are some 60 coal exploration permits granted or under application in the study area, or straddling the border of the study area. These are listed on page 15. Hence, Energy Economics considers the risk of structural decline in coal exports via DBCT occurring within a 50 year time frame is small. Beyond this time frame the potential risks, both in terms of potential sources of coal supply to the port and demand for coal in international markets, increase considerably. **Energy Economics therefore recommends the Authority adopt an economic life for the Dalrymple Bay coal terminal of 50 years.**

SALEABLE RESOURCE ESTIMATES FOR NON-BHPB TENEMENTS

Mt

Mine	Area	MineType	Measured	Indicated	Total
Blair Athol		surface	83	3	86
Isaac Plains		surface	28	7	35
Burton	Inc. Broadmeadow deposit	surface	55	-	55
Burton U/G (Kerlong)		underground	54	75	129
Clermont		surface	197	-	197
Codrilla		underground	-	15	15
Codrilla		surface	42	3	45
Coppabella		surface	102	-	102
Coppabella		underground	31	82	113
Eaglefield (North Goonyella)		surface	21	-	21
Foxleigh	Foxleigh South	underground	-	71	71
Foxleigh	Foxleigh South	surface	14	-	14
Foxleigh	Inc. Foxleigh East. Exc. Foxleigh Sth	underground	-	28	28
Foxleigh	Inc. Foxleigh East. Exc. Foxleigh Sth	surface	74	-	74
German Creek U/G's		underground	202	38	240
German Creek O/C	Exc. GK East, Oak Park & L. Lindsay	surface	4	4	8
German Creek O/C	GK East & Oak Park	surface	37	26	63
Grosvenor	Pre shift of Moranbah Sth boundary	surface	-	20	20
Grosvenor	Pre shift of Moranbah Sth boundary	underground	205	110	315
Hail Creek	Lake Elphinstone	surface	-	61	61
Hail Creek		underground	-	105	105
Hail Creek	Exc. Lake Elphinstone.	surface	188	122	310
Hillalong		surface	10	1	11
Hillalong		underground	11	41	52
Lake Lindsay (Girrah)		underground	9	33	42
Lake Lindsay (Girrah)		surface	45	29	74
Middlemount		underground	100	33	133
Middlemount		surface	23	3	26
Moorvale & Olive Downs	Moorvale	surface	37	8	44
Moorvale & Olive Downs	Moorvale	underground	-	-	-
Moorvale & Olive Downs	Olive Downs	surface	26	9	35
Moorvale & Olive Downs	Olive Downs	underground	-	268	268
Moranbah North		underground	166	95	261
Moranbah O/C (Millennium)		surface	19	-	19
Moranbah South		underground	-	465	465
Moranbah U/G (Millennium)		underground	-	30	30
Mount Fort Cooper/Carinyah		surface	-	70	70
North Goonyella U/G		underground	154	-	154
Oaky Creek		underground	160	106	266
Oaky Creek		surface	9	13	22
Rugby (Diamond Creek)		underground	-	180	180
Vermont (Lake Vermont)		surface	80	-	80
Vermont (Lake Vermont)		underground	195	NA	195
Winchester South		surface	90	-	90
Minus indicative 22% of Oaky Creek coal via Gladstone			-37	-26	-63
TOTAL			2,432	2,127	**4,559**
- Open Cut			1,155	366	1,521
- Underground			1,278	1,760	3,038
Indicative conversion rate to measured			100%	80%	
- Open Cut			1,155	293	1,448
- Underground			1,278	1,408	2,686
- Total			2,432	1,701	**4,134**
Indicative conversion of measured to recoverable @ 80% OC, 60% UG					
- Open Cut			924	234	1,158
- Underground			767	845	1,611
- Total			1,690	1,079	**2,770**
Estimated saleable reserves at 80% yield					
- Open Cut			739	188	927
- Underground			613	676	1,289
- Total			1,352	864	**2,216**

Note: For Coppabella, Hail Creek and Oaky Creek the split between opencut and underground resources is estimated.

NON-BHP BILLITON EXPLORATION PERMITS COAL (EPC'S)

In the Hay Point Catchment Area

Tenure Type	Tenure Number	Status	Sub-Status	Date Granted	Date Expires	Principal Holder
EPC	747	GRAN		3-Jul-02	2-Jul-05	ANGLO COAL (GERMAN CREEK) PTY LTD
EPC	748	GRAN		3-Jan-02	2-Jan-07	ANGLO COAL (GERMAN CREEK) PTY LTD
EPC	887	APPL	PROP			AUSQUEST LIMITED
EPC	930	APPL				AUSTRALIAN VISUAL COMMS LIMITED
EPC	752	GRAN		10-Apr-02	9-Apr-07	BOWEN CENTRAL COAL PTY LTD
EPC	753	GRAN		10-Apr-02	9-Apr-05	BOWEN CENTRAL COAL PTY LTD
EPC	795	GRAN		25-Feb-03	24-Feb-06	BOWEN CENTRAL COAL PTY LTD
EPC	830	GRAN		9-Jul-03	8-Jul-06	BOWEN CENTRAL COAL PTY LTD
EPC	883	APPL	PROP			BOWEN CENTRAL COAL PTY LTD
EPC	692	GRAN		23-Mar-99	23-Mar-06	CAML RESOURCES PTY LTD
EPC	826	GRAN		10-Apr-03	9-Apr-05	CAML RESOURCES PTY LTD
EPC	925	APPL				CAML RESOURCES PTY LTD
EPC	545	GRAN		31-Aug-94	30-Aug-05	CHERWELL CREEK COAL PTY LTD
EPC	739	APPL	PROP			CHRISTOPHER IAN WALLIN
EPC	712	APPL	PROP			CUBA MINING PTY LTD
EPC	900	APPL	PROP			ENERGY MINERALS PTY LTD
EPC	775	GRAN		22-Nov-02	21-Nov-05	HANNIGAN & ASSOCIATES PTY LTD
EPC	776	GRAN		22-Nov-02	21-Nov-05	HANNIGAN & ASSOCIATES PTY LTD
EPC	835	GRAN		26-Aug-03	25-Aug-06	MACARTHUR EXPLORATION PTY LTD
EPC	836	APPL	PROP			MACARTHUR EXPLORATION PTY LTD
EPC	850	GRAN		11-May-04	10-May-09	MACARTHUR EXPLORATION PTY LTD
EPC	726	GRAN		19-Mar-01	18-Mar-09	MILLENNIUM COAL PTY LTD
EPC	855	GRAN		20-Oct-03	19-Oct-06	MILLENNIUM COAL PTY LTD
EPC	657	GRAN		23-Nov-99	22-Nov-05	MOORVALE COAL PTY LTD
EPC	660	GRAN		27-Aug-99	26-Aug-05	MOORVALE COAL PTY LTD
EPC	666	GRAN		19-Aug-99	18-Aug-05	MOORVALE COAL PTY LTD
EPC	682	GRAN		27-Aug-99	26-Aug-05	MOORVALE COAL PTY LTD
EPC	688	GRAN		19-Aug-99	18-Aug-05	MOORVALE COAL PTY LTD
EPC	708	GRAN		12-Nov-04	11-Nov-09	MOORVALE COAL PTY LTD
EPC	721	GRAN		30-Oct-00	29-Oct-06	MOORVALE COAL PTY LTD
EPC	749	GRAN		13-Dec-01	12-Dec-05	MOORVALE COAL PTY LTD
EPC	757	GRAN		13-Dec-01	12-Dec-05	MOORVALE COAL PTY LTD
EPC	706	APPL	PROP			MORANBAH NORTH COAL PTY LTD
EPC	667	GRAN		31-May-00	30-May-05	NEBO CENTRAL COAL PTY LTD
EPC	675	GRAN		24-Mar-00	23-Mar-05	NEBO CENTRAL COAL PTY LTD
EPC	719	GRAN		28-Jun-04	27-Jun-06	NEBO CENTRAL COAL PTY LTD
EPC	722	GRAN		28-Sep-04	27-Sep-06	NEBO CENTRAL COAL PTY LTD
EPC	766	GRAN		3-Sep-02	2-Sep-05	NEW HOPE EXPLORATION PTY LTD
EPC	777	GRAN		4-Jun-03	3-Jun-06	NEW HOPE EXPLORATION PTY LTD
EPC	837	GRAN		20-Oct-03	19-Oct-06	NEW HOPE EXPLORATION PTY LTD
EPC	865	GRAN		8-Jun-04	7-Jun-06	NEW HOPE EXPLORATION PTY LTD
EPC	801	GRAN		10-Sep-04	9-Sep-09	OME COAL PTY LTD
EPC	614	GRAN		16-Aug-96	15-Aug-05	QCOAL PTY LTD
EPC	782	GRAN		10-Apr-03	9-Apr-05	QUEENSLAND COAL RESOURCES PTY LTD
EPC	858	GRAN		27-Jul-04	26-Jul-09	QUEENSLAND COAL RESOURCES PTY LTD
EPC	818	GRAN		22-Nov-02	21-Nov-05	RESTPINE PTY LTD
EPC	842	GRAN		13-Sep-04	12-Sep-09	RIO TINTO EXPLORATION PTY LIMITED
EPC	843	GRAN		13-Sep-04	12-Sep-09	RIO TINTO EXPLORATION PTY LIMITED
EPC	844	GRAN		13-Sep-04	12-Sep-09	RIO TINTO EXPLORATION PTY LIMITED
EPC	845	GRAN		13-Sep-04	12-Sep-09	RIO TINTO EXPLORATION PTY LIMITED
EPC	846	GRAN		21-Nov-03	20-Nov-08	RIO TINTO EXPLORATION PTY LIMITED
EPC	847	GRAN		21-Nov-03	20-Nov-08	RIO TINTO EXPLORATION PTY LIMITED
EPC	848	APPL	PROP			RIO TINTO EXPLORATION PTY LIMITED
EPC	849	GRAN		21-Nov-03	20-Nov-08	RIO TINTO EXPLORATION PTY LIMITED
EPC	733	GRAN		2-Apr-01	1-Apr-05	ROBERT FRASER
EPC	625	GRAN		10-Nov-03	9-Nov-05	ROSS PASTORAL CO PTY LTD
EPC	905	APPL				SWANBANK RESOURCES PTY LTD
EPC	713	GRAN		27-Sep-00	26-Sep-06	XSTRATA COAL QUEENSLAND PTY LTD
EPC	727	GRAN		15-Mar-01	14-Mar-06	XSTRATA COAL QUEENSLAND PTY LTD
EPC	774	GRAN		6-Mar-03	5-Mar-08	XSTRATA COAL QUEENSLAND PTY LTD
EPC	839	GRAN		17-Sep-03	16-Sep-08	XSTRATA COAL QUEENSLAND PTY LTD
EPC	841	GRAN		28-Jun-04	27-Jun-09	XSTRATA COAL QUEENSLAND PTY LTD

Exludes those EPCs known to be incorporated in the resource tabulation on the previous page

6. BHP BILLITON COAL RESOURCES

BHP Billiton controls more of the defined reported coal resources in catchment area of the Port of Hay Point than all of its competitors combined. According to its 2004 annual report BHP Billiton and its partners hold 6.6 billion tonnes of measured and indicated coal resources in the study area. This compares with 4.6 billion tonnes of measured and indicated reserves reported by other companies.

In general, the parameters used to convert resources to indicative saleable production for the non-BHPB mines, discussed in the previous section, have also been applied to estimate the resultant production from BHPB mines. The only exception is that the recoverable reserves and marketable reserve reported by BHPB indicate that a yield of 62% is more appropriate for the BHPB tenements.

The resultant net 'saleable' reserves of the BHPB controlled tenements are 2.6 billion tonnes, as tabulated overleaf.

In 2004 BHPB secured an additional 3 Mtpy of DBCT throughput entitlement. Exports of coal from BHPB mines through DBCT will therefore increase over the short term. Under a scenario whereby 5 Mtpy of coal from BHPB mines is exported via DBCT, the indicative operating life of the HPCT would be ***57 years*** at he 40 Mtpy capacity the terminal is currently being expanded to.

BHP Billiton is expected to expand the capacity of the port to 51 Mtpy by 2007 or 2008. At this capacity, again assuming 5 Mtpy of coal from BHPB mines is exported via DBCT, the indicative life of the currently reported coal resources would be ***46 years***.

All of the above discussion is predicated solely on currently defined measured and indicated coal resources. BHP Billiton and its partners continue to actively explore in catchment area.

BHP BILLITON'S EXPLORATION PERMITS COAL (EPC)

In the Hay Point Catchment Area

Tenure Type	Tenure Number	Status	Sub-Status	Date Granted	Date Expires	Principal Holder
EPC	636	GRAN		1-Oct-99	30-Sep-05	BHP COAL PTY LTD
EPC	718	GRAN		26-Sep-00	25-Sep-05	BHP COAL PTY LTD
EPC	743	GRAN	RENL	5-Dec-01	4-Dec-04	BHP COAL PTY LIMITED
EPC	779	GRAN	RENL	6-Jan-03	5-Jan-05	BHP COAL PTY LTD
EPC	808	GRAN		22-Nov-02	21-Nov-05	BHP BILLITON MINERALS PTY LTD
EPC	809	GRAN		22-Nov-02	21-Nov-05	BHP BILLITON MINERALS PTY LTD
EPC	810	GRAN		11-Dec-02	10-Dec-05	BHP BILLITON MINERALS PTY LTD
EPC	874	GRAN		7-Jul-04	6-Jul-09	BHP BILLITON MINERALS PTY LTD
EPC	875	APPL	PROP			BHP BILLITON MINERALS PTY LTD
EPC	876	GRAN		23-Jun-04	22-Jun-09	BHP BILLITON MINERALS PTY LTD
EPC	877	GRAN		20-May-04	19-May-09	BHP BILLITON MINERALS PTY LTD
EPC	878	GRAN		18-Jun-04	17-Jun-09	BHP BILLITON MINERALS PTY LTD
EPC	879	APPL	PROP			BHP BILLITON MINERALS PTY LTD
EPC	911	APPL				BHP BILLITON MINERALS PTY LTD
EPC	928	APPL				BHP MITSUI COAL PTY LTD

BHP BILLITON SALEABLE RESOURCE ESTIMATES

Mt

Mine	Area	MineType	Measured	Indicated	Total
Bee Creek		surface	-	55	55
Crinum		underground	65	66	131
Daunia		surface	75	24	99
Goonyella O/C		surface	475	312	787
Goonyella U/G (Broadmeadow)		underground	43	559	602
Gregory O/C	Exc. Liskeard	surface	16	6	22
Gregory O/C	Liskeard	surface	6	-	6
Norwich Park		underground	118	168	286
Norwich Park		surface	130	-	130
Peak Downs		underground	-	345	345
Peak Downs		surface	891	272	1,163
Peak Downs East		underground	-	668	668
Poitrel/Winchester		surface	95	41	136
Red Hill		underground	90	406	496
Red Hill		surface	-	25	25
Riverside		surface	6	2	8
Saraji		underground	-	-	-
Saraji		surface	350	288	638
South Walker Creek	Inc Kemmis/Walker.	underground	-	141	141
South Walker Creek	Inc Kemmis/Walker	surface	95	57	152
South Walker Creek	Nebo West	surface	-	178	178
Wards Well		underground	331	289	620
Minus indicative 55% of Gregory/Crinum coal via Gladstone			-48	-40	-87
TOTAL			2,738	3,862	**6,601**
- Open Cut			2,127	1,257	3,384
- Underground			611	2,606	3,217
Indicative conversion rate to measured			100%	80%	
- Open Cut			2,127	1,005	3,132
- Underground			611	2,085	2,696
- Total			2,738	3,090	**5,828**
Indicative conversion of measured to recoverable @ 80% OC, 60% UG					
- Open Cut			1,702	804	2,506
- Underground			367	1,251	1,617
- Total			2,068	2,055	**4,123**
Estimated saleable reserves at 62% yield *1					
- Open Cut			1,055	499	1,554
- Underground			227	775	1,003
- Total			1,282	1,274	**2,556**
Indicative Economic Life of Hay Point Coal Terminal					
At a capacity of 40 Mtpy				Years	64
At a capacity of 40 Mtpy, plus 5 Mtpy via DBCT				Years	57
At a capacity of 51 Mtpy				Years	50
At a capacity of 51 Mtpy, plus 5 Mtpy via DBCT				Years	**46**

*1 Average yield for those mines/projects for which BHPB has reported marketable reserves.

Note: For Saraji, Norwich Park & South Walker Creek the split between opencut and underground resources is estimated.

Source: Coal resource tonnages are from the BHP Billiton Plc 2004 Annual Report

In addition to the measured and indicated coal resources BHP Billiton reports 1.097 billion tonnes of indicated coal resources within the study area. BHP Billiton and its subsidiaries have 15 active Exploration Permits for coal in the catchment area, as tabulated on page 16. It is therefore highly likely that the company will continue to augment its coal resources in the catchment area. It is not possible to provide a numerical estimate of how much additional resource will be defined by ongoing exploration programmes, but the life of the HPCT is considered likely to be well in excess of the figures calculated solely from current measured and indicated coal resource.

7. TOTAL COAL RESOURCES

There is currently an imbalance within the Port of Hay Point catchment area, with BHP Billiton and its partners holding most of the coal resources in the study area while owning the smaller of the two coal terminals in terms of throughput capacity. At present BHP Billiton appears to favour expansion of the HPCT, rather than exporting increased tonnages of coal produced at BHP Billiton mines through the DBCT. However there is no certainty that this strategy will not change over the coming decades. Therefore it is part of the Queensland Competition Authority brief for this assignment to estimate the life of the coal terminals at the Port of Hay Point as a single entity.

The combined measured and indicated coal resources of all mining companies operating within the catchment area of the Port of Hay Point are 11.16 billion tonnes. This equates to an indicative inventory of product coal of 4.77 billion tonnes, as calculated in the preceding two chapters. An integrated system approach would therefore give the follow indicative life of the total reported measured and indicated resources in the catchment area of the Port of Hay Point.

PORT OF HAY POINT COAL TERMINAL - INTEGRATED SCENARIO

Mtpy except where otherwise indicated

	Dalrymple Bay Coal Terminal Capacity	Hay Point Coal Terminal Capacity	Total Port Capacity	Life (years)
Current Capacity	53	35	**88**	**54**
Current Expansion	60	40	**100**	**48**
Future Scenario 1			**120**	**40**
Future Scenario 2	75	51	**126**	**38**

Based on total indicative 'saleable' coal inventory of 4.77 billion tonnes as derived in the preceding two chapters, **excluding inferred resources and other coal occurrences not currently defined as resources.**

As reiterated throughout this report the ‘resource lives’ tabulated above are likely to be greatly extended by additions to the inventory of measured and indicated resources through ongoing exploration.

8. APPENDIX - GLOSSARY AND ABBREVIATIONS

AFC (Armoured Face Conveyor): A specialised conveyor, comprised of steel pans and chains, used to transport coal along a longwall face. Coal cut by the longwall shearer falls onto the AFC and is transported to the end of the longwall face where the coal is transferred onto a more conventional belt conveyor for transport out of the mine.

Bank Cubic Metre (BCM): A measure of the volume of overburden material moved in order to expose the coal seams. A cubic metre of material measured *in situ* prior to excavation. In dragline operations this measure excludes the re-handling of overburden after its initial excavation. Dragline operations typically re-handle some 25% of the overburden.

Bord & Pillar: (Synonym: room & pillar) An underground mining method where a rectangular lattice of underground roadways are developed within a coal seam, leaving rectangular pillars of coal between the roadways to support the roof. When these 'first workings' are completed in a particular section of the mine, partial extraction of the pillars takes place, commencing at the outer boundary of the section, with the size of the remnant pillar stumps being dictated by safety and roof support requirements.

CHPP: Coal handling and preparation plant. A generic term for that includes associated crushing, screening, washing stockpiling and rail loading facilities.

Coal Reserve: the *economically mineable part of a Measured and/or Indicated Mineral Resource* (see below). It includes diluting materials and allowances for losses, which may occur when the material is mined. Reserves are sub-divided in order of increasing confidence into Probable Coal Reserves and Proved Coal Reserves.

Coal Resource: An occurrence of coal of intrinsic economic interest in such form, quality and quantity that there are *reasonable prospects for eventual economic extraction.* Mineral Resources are sub-divided, in order of increasing geological confidence, into Inferred, Indicated and Measured categories.

Coking Coal: A coal with caking properties that makes it suitable for use as a raw material in the production of coke. In general a number of coal brands with complementary properties are blended together prior to being loaded into coke ovens. Coking coal is a subcategory of metallurgical coal.

CSN (Crucible Swelling Number): A measure of the capacity of a coal to swell when heated – an important property of a coking coal. The CSN is an index ranging from 1 – 10. As a guide, hard coking coals typically have a CSN of over 5.5. Semi-coking coals have CSN values ranging from 2 – 5.5, while coal with CSN of less than 2 are considered to be non-coking coals (steam coal).

DBCT: The Dalrymple Bay Coal Terminal

Dilution: Rock contamination included in the ROM coal; either from the roof or floor of the coal seam, or from a rock layer within the coal seam.

Drift: An inclined underground roadway, typically used to access a coal seam from the surface and to transport raw coal from the mine to the surface.

FOB: Free-On-Board. The price or cost of coal after it has been loaded onto a vessel at the port of dispatch. In other words, the price or cost of coal excluding those costs associated with shipping and unloading at the destination port.

Gate Road: An underground roadway driven out from the 'mains' to form the sides of a longwall panel. Typically two or three gate roads are driven on each side of a longwall panel.

HPCT: The Hay Point Coal Terminal

ROM: Run-Of- Mine. Raw coal production measured prior to any subsequent treatment for removal of unwanted material (rejects) in coal preparation plants.

Longwall: an underground mining method whereby coal is extracted from a large rectangular block of coal (a longwall panel) by the progressive removal of thin slices of coal, commencing from the vertical coal face that forms the shorter dimension of the rectangular block (typically 100 – 300m) and working through the block to the other end. Longwall panel lengths typically range from 1 km to 6 km. A longwall shearer travels back and forward along the face, cutting a slice of coal off the face then advancing its position to cut the next slice. The coal cut from the face falls onto a special conveyor (an armoured face conveyor or AFC) that runs the length of the longwall face and transports the coal to the end of the face, where the coal is transferred onto a more conventional belt conveyor for transport out of the mine.

The strata above the longwall shearer are held up temporarily by a line of hydraulic roof supports (chocks), which are positioned in a line that extends right along the longwall face. As the shearer moves along the face the longwall supports behind it are one-by-one lowered, advanced forward, and raised again to support the roof up close to the new longwall face. Usually the progressive advance of the longwall supports is computer controlled. As this happens the roof strata behind the longwall supports collapses into the void where the coal seam used to be. In this way the longwall system 'walks' its way from one end of the longwall panel to the other, extracting the coal seam continuously as it goes.

Prior to mining a panel using the longwall system, access roadways must be driven within the coal seam along all four sides of the panel to allow access for installation of the longwall system, a conveyor, ventilation systems etc. These roadways are constructed by a separate mining system. The construction of these access roadways is known as development, and the coal produced in such a way is reported as development coal.

Metallurgical Coal: Coal can be categorised into two broad groups, metallurgical coal and steam coal, according to end use. Metallurgical coal has specific attributes that make it suitable for use in the steel making process. The metallurgical coal category includes subcategories mainly used for coke making (hard coking coal, semi-hard coking coal, semi-soft coking coal) and coal for pulverised coal injection (PCI) directly into blast furnaces.

Mt: Million metric tonnes

Opencast: (Synonyms: open-cut, surface) A mining system involving the complete removal of overburden to expose the target coal seam, typically using draglines or shovels and trucks.

Punch Longwall: Most longwall mining involves driving a series of parallel roadways (mains) into the heart of a coal reserve, then developing longwall panels out at right angles to the 'mains'. Punch longwall mining does away with the requirement for mains, with the longwall panels being developed directly into a coal seam exposed at the surface. Generally the seam exposure has been created by opencast mining that has progressed to the maximum depth of cover that is economic for opencast mining. In some other cases a purpose built V-shaped excavation is constructed to expose the coal seam. Punch longwall operations are typically lower cost operations than standard longwall operations as the requirement for expensive roadway development is reduced.

PCI (Pulverised Coal Injection): Coal directly injected into a blast furnace in order to partially substitute the consumption of coke, which is more expensive. Both the PCI coal and the coke act as both an energy source and as a reductant to convert iron oxides to iron in the blast furnace. A wide variety of coals are used for PCI, including steam coal, semi-soft coking coal and, increasingly, low volatile bituminous coals – but the ash-content is generally restricted to below 10% on an air-dried basis.

Saleable Production: (Synonyms: marketable production, clean coal production) Processed coal production measured after any removal of unwanted material (rejects) in coal preparation plants.

Steam Coal: (Synonyms: thermal coal, energy coal) Coal can be categorised into two broad groups, metallurgical coal and steam coal, according to end use. Steam coal is coal that does not have significant coking properties and other specialist properties that are required for use in steel making. Steam coal is instead used primarily in the electricity generation sector, with other significant end uses being cement manufacture and general industry. The boundary between steam coal and metallurgical coal is blurred, with many brands of low ash coal 'steam coal' being used for both electricity generation and for pulverised coal injection (PCI) into blast furnaces.

Tph: metric tonnes per hour

Volatile Matter: That portion of a coal sample that can be gassified at relatively low temperatures. Determined by a proximate analysis, which involves the progressive heating of a coal sample to progressively drive off the moisture then the volatile matter, with the remaining solid residual being termed fixed carbon. Low volatile coals are generally unsuitable for burning in standard power stations, but have become firmly established as the coal of choice for pulverised coal injection (PCI) into blast furnaces.

Washery: A coal processing plant used to remove high ash materials and rock particles from the coal after the coal has been crushed and screened. Typically the separation is made on the basis of particle density, with dense medium cyclones used to process the courser fractions and spirals or froth floatation used to process the fine fraction.

Washery Yield: Saleable production divided by ROM production, expressed as a percentage. A measure of the loss of reject material (rock or high ash coal) during the washing process.