IPART 2014 review of remaining mine life under the NSW Rail Access Undertaking—Draft report

Mike Smart

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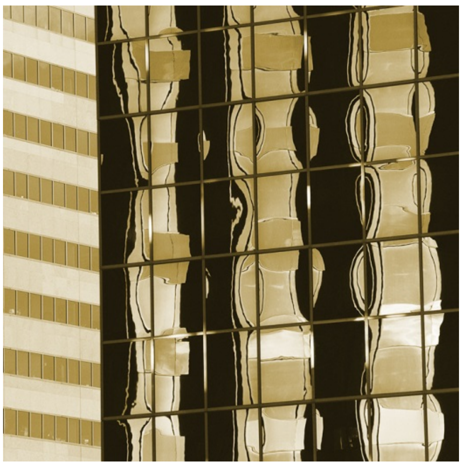

About the Author

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Mike is the author of previous reports for IPART on RailCorp and ARTC compliance with the NSW Rail Access Undertaking.

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Sapere Research Group is one of the largest expert consulting firms in Australasia and a leader in provision of independent economic, forensic accounting and public policy services. Sapere provides independent expert testimony, strategic advisory services, data analytics and other advice to Australasia's private sector corporate clients, major law firms, government agencies, and regulatory bodies.

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1 Context

The NSW Rail Access Undertaking ("RAU") specifies rules governing the maximum and minimum access revenues that may be earned by track owners and lessees to which it applies. These rules are found in the Pricing Principles, Schedule 3 to the RAU. Maximum revenues are established using a building block approach that determines the full economic cost for each group of line sections. One of these building blocks is the economic depreciation on the relevant asset base.

Clause 3.2 of Schedule 3 applies specifically to the Hunter Valley Coal Network ("HVCN"), which is defined as a particular group of track sections that are set out in Schedule 6. According to clause 3.2 (c), depreciation must be calculated each year using a straight-line methodology and an estimate of the remaining useful life of the assets. Clause 3.2 (c)(ii) states that "*the useful life of a Sector or group of Sectors is to be determined by reference to the remaining mine life of Hunter Valley coal mines utilising that Sector or those Sectors.*"

Clause 3.2 (c)(iii) sets the initial estimate of remaining mine life at 40 years from 1 July 1999. This estimate implies a terminal date, when assets would become fully depreciated, of 1 July 2039. Clause 3.2 (c)(iv) provides for a review of the mine life estimate every five years. IPART has previously reviewed the remaining mine life in 2004 and 2009. Each time, IPART decided to leave the 2039 terminal date unchanged.

This report forms part of IPART's third such review.

1.1 Original basis for 2039 terminal date

In its 1999 Final Report "Aspects of the NSW Rail Access Regime" IPART established the 40 year estimate of remaining mine life taking into account two issues. First, the estimated rail infrastructure asset life was 39.4 years (Table 7, p. 44). Second, 40 years of remaining mine life represented a midpoint between a 50 year life estimate submitted by the NSW Minerals Council and a 30 year life estimate submitted by the Rail Access Corporation.

The Minerals Council submission was informed by the estimate at that time of 5.7 billion tonnes of proven reserves and a production estimate of between 80 and 195 Mtpa (p. 45). Current and projected production levels are between these limits.

The coincidence between the asset life and the mine reserve life lent some confidence to IPART's conclusion, despite the fact that future coal production levels were very difficult to forecast, and reserve estimates were also likely to change as exploration progressed and world coal market conditions changed.

1.2 2009 IPART review of mine life

For the 2009 IPART review, ARTC submitted a detailed analysis of mine-by-mine reserves and production forecasts to support its submission for an earlier terminal date (implying higher depreciation charges for the near future). Two aspects of this approach in particular were tested by IPART.

First, ARTC's preferred approach was to exclude from the calculation reserves that were not expected to start production within the next five years. Major exploration areas Maules Creek, Watermark and Caroona were thereby excluded. This five-year limit is artificial, given that the matter at issue is the continuation of coal mining to the terminal date of around 2039. The high likelihood that these prospective mining areas will produce coal before the terminal date is emphasised by the fact that hundreds of millions of dollars were paid for the exploration licenses there. Inclusion of these prospects increased the average mine life by several years, even on ARTC's conservative calculation.

Second, ARTC asserted that the depreciation life for each group of line sections should be the weighted average of the individual expected lives of the mines using the line sections. IPART's consultant LECG did not support the weighted average life methodology, which was shown to create a greater risk of asset stranding in the future than the LECG-preferred LLSM methodology (discussed below in section 3.2).

IPART decided to maintain the 2039 terminal date in its 2009 Final Decision on mine life.

1.3 ACCC decision on ARTC HV undertaking

On 29 June 2011, the ACCC approved ARTC's Hunter Valley Coal Network Access Undertaking. The approved version of this undertaking (dated 23 June 2011) noted (clause 4.7) that depreciation was to be calculated on a straight line basis with respect to specific assets and the estimate of remaining useful life of those assets. The useful life of a group of segments is to be determined with regard to:

- Average remaining mine life of coal mines using the relevant pricing zone;
- Average mine production levels anticipated during the undertaking term having regard to coal chain capacity constraints; and
- Marketable coal reserves estimated for each mine that exists or is anticipated commencing within 5 years.

The average remaining mine life may differ between pricing zones.

The ARTC proposal of June 2010 was for a 23.9 year mine life from 2008/09 (corresponding to a terminal date of July 2033) for the entire Hunter Valley coal network. The ACCC accepted this proposal in its 21 December 2010 Position Paper prior to its June 2011 approval of the HVCNAU.

2 New issues arising

Since the 2009 review, there have been two developments relevant to the mine life question. First, more information has become available on coal reserves, production rates, and coal market dynamics. While much of this information is not in the public domain, some of it is published by the NSW Government in its 2013 Coal Industry Profile, to which regard was had in preparing this report. The prospects have firmed for the development of Maules Creek, Watermark and Caroona. While the latter two of these are still subject to uncertainty over environmental approvals, this uncertainty is likely to affect how and when, not whether these deposits will be mined.

Second, the geographic scope of IPART's jurisdiction has changed in some important ways since 2009. Most of ARTC's HVCN now falls under the ACCC's jurisdiction. That part of the network is subject to ARTC's 2011-approved HVCNAU. IPART's mine life determination is no longer relevant to pricing there. Each of these developments is analysed in a separate section below.

2.1 New mines, extended reserve life

Since IPART's 2009 review of mine lives, several prospective mines have received governmental approvals (see http://www.resources.nsw.gov.au/resources/coal/new-mines-and-projects):

- Narrabri Coal received approval in July 2010 for Stage 2, involving the establishment of longwall mining operations and an increase in maximum production from 2.5 to 8.0 Mtpa;
- Shenhua Energy's Watermark coal exploration license was granted in October 2008, but community consultation has pushed the start date for this > 1 billion tonne resource into the future. This delay will extend the mine life on the Turrawan – Gap line.

According to its owner (see http://www.whitehavencoal.com.au/operations/maules_creek.cfm) the Maules Creek mine was fully approved in July 2013. This mine is expected to generate approximately 12 Mtpa railed coal and last for more than 30 years from the beginning of mining operations (expected early in calendar 2015).

The Maules Creek, Watermark and Caroona projects in the Gunnedah Basin were excluded from the ARTC 2009 mine life calculations. However, they were included in ARTC's sensitivity cases in which the life of mines North of Muswellbrook was increased from 20 to 32.5 years.[1]

2.2 Changes to IPART's geographic scope

2.2.1 IPART focus narrowed to RailCorp HVN

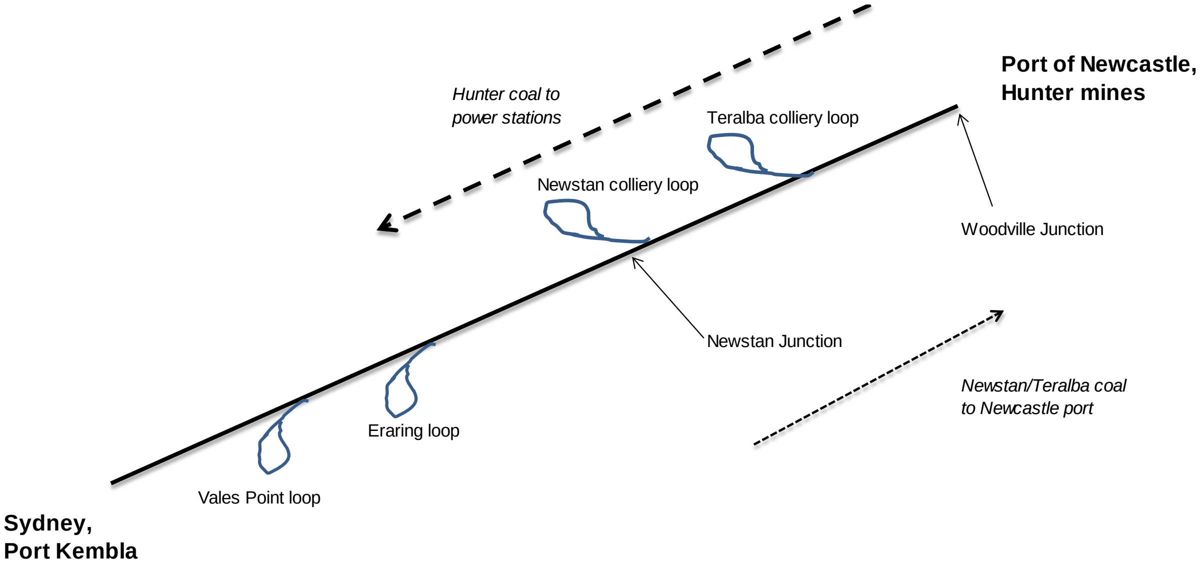
With the change to Commonwealth jurisdiction of the central Hunter system, IPART's geographic scope within the Hunter Valley Coal Network is now limited to five sectors between Newstan Junction and Woodville Junction. These sectors are used primarily by electric passenger trains travelling between Sydney and Newcastle. Coal traffic on these sectors is of three types (see Fig.1):

- Northbound coal from the Newstan colliery to Newcastle Port;
- Occasional coal movements between the Hunter Valley and Port Kembla; and
- Southbound coal from the Hunter Valley to the power stations at Vales Point and Eraring.

RailCorp is the owner and operator of these sectors. Recent reviews by IPART have found that RailCorp is earning access revenues on this corridor that approach or exceed the stand-alone cost ceiling.

[1] See "ARTC Explanatory Guide 2010 HVAU, Appendix 2 – ARTC revised remaining mine life estimate," Table 1, p. 5, last row.

Figure 1. Diagram of RailCorp HVN with traffic indicated



2.2.2 Turrawan to The Gap

The line from Turrawan (near Narrabri) to The Gap (near Werris Creek) is operated by ARTC. These sectors, to the North of Dartbrook Junction, were not included in the original Schedule 6 to the RAU, which specified the extent of the HVCN.

However, as these sectors are home to the most rapidly growing coalfields in NSW, IPART last year performed a detailed analysis of 2012 coal access revenues in comparison to the full economic costs there. IPART concluded that access revenues were less than 80% of the full economic costs for 2012. That finding implies that the ceiling test in the RAU would not presently constrain access prices for that corridor.

For that reason, and in light of the fact that these sectors do not currently form part of the HVCN, this report does not further consider the question of remaining mine life for the Turrawan – Gap section.

3 Alternative methodologies

During IPART's 2009 review of mine life, IPART's consultant LECG considered three alternative methodologies for calculating depreciation:

1. Weighted average mine life (WAL), with linear depreciation (as proposed by ARTC);
2. Longest lived substantial mine life (LLSM), with linear depreciation; and
3. Unit of production (UOP), with depreciation value depending on mine output, rather than time.

LECG's conclusion was that the UOP methodology provided the least distorted pricing signals and created the least risk of asset stranding toward the end of the rail infrastructure's life. These advantages of UOP arise from the fact that it leads to depreciation charges that are linearly related to tonnage railed.

However, given the inconsistency between UOP and the RAU's requirement that depreciation profiles be linear in time, LECG expressed a preference for the LLSM methodology over WAL. The reason for this preference is that, as a practical matter, the operator of a rail line will keep it open so long as there is substantial output from any mine using it.

3.1 WAL

ARTC advocated the use of a Weighted Average Life in 2009. Under this approach, a set of mines is identified that make use of a particular group of sectors. For each of these mines, the remaining reserves and the average yearly coal output are determined. The expected life of an individual mine is simply the reserve quantity divided by average annual output. The useful life of the line is the weighted average of the expected lives of these mines. The mine reserves are the weighting factors.

This methodology is one way of satisfying the requirement of clause 3.2 (c)(ii) of Schedule 3 of the RAU that the useful life of a sector should be determined by reference to the remaining life of mines utilising that sector. But as this clause does not specify precisely how the remaining life of mines should be referenced, the WAL method is not the only one available.

If there were only one mine on a given line, and if the output from that mine were the same in every year until it closed, then the WAL method would generate a constant depreciation charge per year and per tonne of coal.

However, in more realistic settings the WAL method is problematic. When there are two or more mines on a line that have different individual lives, the weighted average life will jump when one closes. That effect will lead to depreciation charges per year that steadily decrease. However, as mines close, the depreciation charges will be spread over a dwindling base of tonnes. That effect could lead to depreciation charges per tonne that either increase or decrease, depending on the pattern of individual mine reserves and output rates.

Toward the end of the tonnage, the net effect will be that depreciation charges per tonne increase strongly. This will push access prices up when they are least affordable, leading to an increased risk of premature closure of the line, stranding of both the remaining coal reserves and the remaining infrastructure asset value, and failure by the infrastructure owner to be able to recover the full value of the original investment.

These adverse outcomes are avoidable by the adoption of alternative depreciation methodologies.

3.2 LLSM

Rather than using the weighted average mine life to establish the terminal date for a railway line, one could use the life of the longest-lived substantial mine. It is common sense to keep a line open as long as there is substantial tonnage left to carry, even if the date is beyond the WAL calculated at some point in history.

That is not to say that the fixed costs of keeping a line open would be justified by any mine production at all. Clearly there will be some minimum threshold tonnage that depends on the length and cost of the line and the willingness of the miner to pay access charges at the required level. However, based on present coal market conditions and infrastructure costs, it would be economic to continue to use the HVCN trunk lines for railed quantities as low as several Mtpa or more.

To implement the LLSM methodology one would take the following steps:

1. Determine a tonnage threshold for 'substantial' output on a given line. This is a matter of judgement.
2. Examine the mines that utilise or could be expected to utilise that line.
3. Among those producing output above the minimum threshold, identify a small group of the ones with the longest lives.
4. Calculate the median life of mines in that group. That would be the estimated useful life of the railway line. The median is chosen to account for uncertainty in the key inputs: reserves and expected annual average production rates

This approach has much to recommend it. First, it accords most closely with the behaviour of a real-world operator of the railway line. Second, the useful life of the line would not change as shorter-lived mines cease production. It would only change if amended estimates of reserves and output rates lead to a change to the identity of the longest-lived substantial mine or to a changed life estimate for that mine. This stability may be helpful in providing certainty to investors in mining, rail and port infrastructure.

However, this approach also suffers from the stranding risk problem that besets the WAL method. The constant depreciation charge per year will translate to an increasing depreciation charge per tonne as aggregate mine output is reduced over time. This will cause affordability problems for the remaining miners toward the end of the line's life, possibly leading to premature closure. Nevertheless, depreciation charges per tonne under the LLSM method will always be lower than those under the WAL method in any given year. The stranding risk will be greater for the WAL method.

3.3 UOP

The most straightforward way to overcome the affordability problem is to set depreciation charges in such a way that they are constant per tonne. The required calculation is straightforward: divide the opening RAB value by the total tonnes of reserves. That depreciation charge in dollars would be applied to every tonne that is mined. As long as the reserve estimate does not change, the calculation would not need to be revisited.

This approach minimises the risk of premature line closure and of stranding coal reserves. It implies that the depreciation charge in dollars will be highest in high-output years, but low in low-output years. It would tailor the incidence of the depreciation burden on customers to match ability to pay (on the assumption that the industry is best able to pay during buoyant high-output years).

3.4 Discussion

The UOP methodology is preferred on grounds of economic efficiency, as it will maximise use of the rail infrastructure and of coal reserves. Unfortunately, it is inconsistent with clause 3.2 (c) of Schedule 3 of the RAU, which requires a depreciation schedule to be linear with respect to time instead of tonnage.

If the UOP methodology cannot be used, then the LLSM method is preferable to the WAL method. LLSM is better attuned to the actual decision calculus of a rail infrastructure provider, and will lead to a depreciation schedule that is more stable and predictable over time, creating a somewhat reduced asset stranding risk compared to the WAL method.

4 Estimation of remaining life

In this section we apply the LLSM method to determine the useful remaining life of the one line section that remains within IPART's jurisdiction: Newstan to Woodville. The mines that utilise this section do so for the purpose of delivering coal to their customers, the coal-burning power stations at Eraring and Vales Point.

The locational advantages enjoyed by the Eraring and Vales Point power stations are sufficiently compelling that, even when the current boiler and turbine equipment there wears out, it would be expected that replacement generating units would be commissioned there, as long as black coal generation remains viable. That means that the engineering life of the current power station equipment may not be relevant for the question at hand—the economic life of the railway line.

More relevant would be the life of coal-burning generation technology in NSW and the (presumably shorter) life of coal reserves in the Hunter and Gunnedah basins. In order to make an estimate of the latter, we apply the LLSM method to data contained in the NSW Coal Industry Profile 2013 (NSW Department of Trade & Investment Resources & Energy), corroborated where possible with other sources.

4.1 Newstan to Woodville

The line from Newstan Junction to Woodville Junction is operated by RailCorp. RailCorp did not put forward an initial proposal on its view of remaining mine life. The primary use of this line is for passenger traffic between Sydney and Newcastle. It is also used for intermodal freight travelling between Sydney and Brisbane.

The only two coal mines on this line are at Newstan and Teralba. Newstan Colliery has been on care and maintenance since 2008, but has produced a small amount of coal (55,000 tonnes) in 2011. The Teralba Colliery has been closed since 2001. This line is sometimes used to transport coal between the Hunter Valley and Port Kembla. These movements are irregular and represent small tonnages in a typical year.

The principal coal-related use of this line is to supply Hunter Valley coal to the power stations at Vales Point (Delta Energy) and Eraring (Origin Energy). The current Vales Point station was commissioned in 1978 and consists of two 660 MW units. The Eraring station was commissioned in 1982 and consists of four 720 MW units.

4.2 Power station life

Clause 3.2 (c)(ii) of Schedule 3 of the RAU stipulates that the useful life of a sector must be referenced to the remaining life of Hunter Valley coal mines utilising it. IPART has advised that it is their interpretation that this reference to the remaining life should include existing coal mines that could reasonably be expected to use the line within the upcoming 5 year review period.

It was noted previously that the coal mines situated on the Newstan to Woodville line are already near the end of their lives. However, the mines that currently supply the Vales Point and Eraring power stations also utilise this line. In the unlikely event that those mines were to cease operation in the near future, it would not mean the end of these power stations and the line. The power stations would simply buy their coal from another Hunter Valley mine, of which there are many.

Clearly, the use of the Newstan – Woodville line by Hunter Valley coal mines will continue as long as either of the power stations remains in operation. Obviously the boilers, turbines and other equipment at a power station have limited engineering lives. The Vales Point A power station was commissioned in the 1960s and decommissioned in the 1980s, a short time after the current Vales Point B power station came on stream. Vales Point B is now 36 years old. The Eraring power station is 32 years old.

I have had regard to a note from Frontier Economics, "*Economic life of Eraring Power Station and Vales Point Power Station—a note prepared for IPART*" (May 2014). This note explains that the economic life of a power station depends on the ability of its revenues to cover fixed and variable operating costs in future. One of the key uncertainties identified by Frontier is the future carbon pricing regime. In the scenarios considered by Frontier to be most likely, namely

(1) carbon price converging to current international carbon prices, or

(2) zero carbon price in the event that the Commonwealth Government's stated intention to repeal the carbon pricing legislation is carried out,

Frontier stated that the economic life of the Eraring power station would most likely extend beyond 2044 and it is possible that the Vales Point power station would extend beyond 2044. While there are other scenarios considered by Frontier under which the economic life might only extend to the 2020s or 2030s, Frontier considers these unlikely to eventuate.

In any event, the locations of both power stations have certain compelling advantages. They are situated:

- on the shore of Lake Macquarie, which provides a reliable source of cooling water;
- close to Sydney, to which they are connected via high voltage lines;
- close to a major source of coal to which they are connected via heavy-haul rail infrastructure and associated conveyors.

Given these locational advantages it seems reasonable to suppose that any future replacement coal-fired power stations may be located at the same places, using the Newstan – Woodville Junction rail line. In support of that claim I briefly mention one of several relevant locations where this *in-situ* replacement has taken place.

The Vales Point Power Station site was first used for Vales Point A (1963-1989) and then Vales Point B (1978 – present). Again, the locational advantages of the site were sufficiently compelling that the replacement generating capacity was installed there, rather than at some other location in the Hunter Valley. While Vales Point A was only in use for 26 years, the site has been in use for 51 years so far.

The experience with coal-burning power plants in the USA suggests a significant proportion of current coal-burning generating capacity was between 51 and 60 years old in 2010 (see : **http://www.eia.gov/todayinenergy/detail.cfm?id=1830**). The historic record for individual generating units in Australia suggest that they have tended so far to remain in use for between 30 and 50 years, but that use of a particular power station site often continues for much longer periods.

This line of reasoning leads to the conclusion that the cessation of Hunter Valley coal supply is the event that would most likely halt the operation of both the Vales Point and Eraring power stations.

In reaching that conclusion, I recognise that Hunter Valley coal is used both for export and for domestic power station use. However, the cost of shipping coal overseas (where much of it is used to generate electricity in China, Japan and Korea) is significant. In a future scenario of declining coal output from the Hunter Valley, domestic power stations would remain capable of affording to buy coal even while export opportunities start to dry up—because of the lower total transport costs for local customers.

In light of the foregoing arguments, the life of the LLSM would represent the best estimate of the life of the Hunter Valley mines that could reasonably be expected to use the Newstan – Woodville line. The following section presents this calculation.

4.3 Estimated life of Newstan - Woodville

Section 3.2 above set out a four-step process for implementing the LLSM calculation. This section applies that process to the Newstan – Woodville line.

1. Tonnage threshold

The coal consumption of the power stations on the Newstan – Woodville track section varies from year to year, but is likely to exceed 4 Mtpa in a typical year. We take this figure as the minimum threshold of substantiality for the LLSM calculation.

A 22 August 2006 Environmental Assessment Scoping Report for the Eraring Power Station 750 MW Upgrade noted (s2.2.2 coal supply, p. 4) that the plant currently burns an average of up to 6.5 mtpa based on an average annual generation of 15,000 GWh. It also noted that coal was then transported to Eraring by conveyor, truck and rail in approximately equal proportions. This suggests that rail delivery of coal to Eraring was up to 6.5 mtpa/3 = 2.2 mtpa.

Eraring's then coal consumption for 4 X 660 MW generation capacity should be approximately halved for the 2 X 660 MW generation capacity of the Vales Point power station. Ignoring differences in plant availability, one would expect Vales Point to burn approximately 6.5 mtpa/2 = 3.2 mtpa. This figure is rough since less is known about coal supply arrangements for Vales Point, which are commercially sensitive.

Combining the estimated rail deliveries of coal for both stations, one would expect a figure around 5.4 mtpa, assuming high plant utilisation. Conservatively, in order to allow for downtime and periods of low demand, we use a coal consumption figure of 4 mtpa.

2. Mines that could be expected to utilise the line

While there are mine-to-mine variations in the precise specifications of coal, these would not be sufficiently great to render the coal of some Hunter Valley mines unusable in the power stations. To the extent that any differences in thermal content might alter the economic attractiveness of coal from some mines, this factor could easily be compensated through price adjustments. In fact, coal prices are likely to be largely determined by thermal content. We assume that Hunter Valley coal from most mines would be sufficiently substitutable so that the power stations could source coal from any mine. On this basis, virtually any Hunter Valley mine could be expected to utilise the Newstan – Woodville line.

3. Small group of longest-lived lines that could utilise the line

In order to identify a small group of the longest-lived mines that could utilise the Newstan – Woodville line, I had regard to information contained in the NSW 2013 Coal Industry Profile, prepared by the NSW department of Trade & Investment, Resources & Energy. This document is the most recent available edition of this reference source. It contains estimates of coal reserves at 30 June 2011, of production in each of the years 2008-9, 2009-10 and 2010-11, and of coal production capacity at each mine given the equipment currently used there.

The general approach to calculating the life of each mine was to divide the quantum of marketable reserves at 30 June 2011 by the average quantum of saleable production per year. This ratio is the approximate number of years of mine life remaining past 30 June 2011. To obtain the implied terminal year for that mine, this ratio was added to 2011 and the result was rounded to the nearest year.

For some mines, the marketable coal reserves were not available. In those cases, I used the measured resources. The difference between reserves and resources is that the former have been identified as being economic to mine. The latter represent coal in the ground, but the economic feasibility of mining it has not yet been determined and may depend, inter alia, on the future price of coal. Resources are of three types: measured, indicated, and inferred—representing a scale of declining certainty. As the measured resources are the most certain, I used this figure when reserve data was not available.

The mine life calculation is straightforward, but it is strongly influenced by the forecast average quantum of coal production each year. This may not be the same as the actual coal production in any given year, particularly for mines that are in a startup phase, ramping up to full production over several years. For mines that had marketable reserve estimates, I used the most recent annual saleable production amount as the forecast for average annual production, unless there was significant output variation within the most recent three years. In that case I used the maximum saleable production over the three-year period.

For mines that did not have marketable reserve estimates, I divided the measured resource estimates by the production capacity at the mine to obtain remaining life after June 2011. This approach appeared to best compare like with like, given the data limitations.[2]

The most long-lived currently operating mines/projects with 4 mtpa production or more are listed in Table 1, which presents information from the Coal Industry Profile 2013. Information for Maules Creek was provided by its owner, Whitehaven Coal.[3]

[2] Comparing marketable reserves with saleable production is like-with-like since non-marketable coal is eliminated from both the numerator and denominator of the ratio. Comparing measured resources with production capacity is also like-with-like since non-marketable coal is included in both the numerator and denominator. Obviously it would be preferable to rely only on marketable coal in this calculation if the data permits.

[3] The Maules Creek figures are from the owner's web site: http://www.whitehavencoal.com.au/operations/maules_creek.cfm (accessed 21 March 2014).

Table 1. Longest-lived substantial Hunter mines capable of serving power stations

NSW CIP Ref No.	Mine/Proposal	Saleable production (Mt)	Production	Marketable coal reserves (Mt) @ 30 June 2011	Reserves / production	Implied end year	Mine life @ 30 June 2014	Notes: unless otherwise specified, mine life based on marketable reserves / highest annual saleable production from 2008-9 to 2010-11
		2010-11	est.					
H2	Bengalla OC	5.34	5.67	131.80	23.25	2034	20	Reserve / max prod 2008-11
H3	Bulga OC/Blakefield South UG	8.57	10.05	250.80	24.96	2036	22	Reserve / max prod 2008-11
H25	Wambo UG and OC	5.69	5.69	150.00	26.36	2037	23	
W20	Wilpinjong OC	9.47	9.47	251.00	26.50	2038	24	Reserve / max prod 2008-11
H9	Hunter Valley Operations OC	11.61	11.61	330.20	28.44	2039	25	
W13	Moolarben OC	5.67	12.8	376.40	29.41	2040	26	Measured resources / prod capacity
H16	Mount Thorley Warkworth OC	9.34	9.34	302.00	32.33	2043	29	
	Maules Creek	N/A	12.4	N/A	30.00	2044	30	*Data from Whitehaven web site*
W19	Ulan UG	3.02	4.69	177.70	37.89	2049	35	
H17	Mt Arthur OC	13.68	20	936.00	46.80	2058	44	Measured resources / prod capacity

Source: NSW Coal Industry Profile 2013 for all mines except Maules Creek. Whitehaven coal web site for Maules Creek.

Note that all of the mines listed in Table 1, apart from Maules Creek, are currently operating, providing more certainty over the forecasts. The final column identifies mines for which information on marketable reserves and saleable production were not available and indicates, for each, what data was used to estimate the mine lives.

4. Median life of small group

The five mines in Table 1 with the longest lives are Moolarben OC, Mount Thorley Warkworth OC, Maules Creek, Ulan UG, and Mt Arthur OC. The median life of this group is 30 years from 2014, implying a terminal date of 2044.

The reason for relying on a median of a group of mines, rather than simply taking the estimated life of the longest-lived mine, is that the uncertainty over life for a single mine is very high. Small changes to the forecast average production level could drastically alter the mine life estimate. This uncertainty is substantially reduced by pooling the data across several mines and taking a median.

On this basis, I recommend increasing the terminal date to 2044, which is an increase of 5 years relative to the current 2039 date. In all likelihood, this is a conservative approach as it takes no account of major new projects at Caroona, Watermark and Mt Pleasant which, between them, have well over 1 billion tonnes in resources. Depending on the target level of production at these mining areas, they could well see Hunter Valley coal mining extend past 2044.

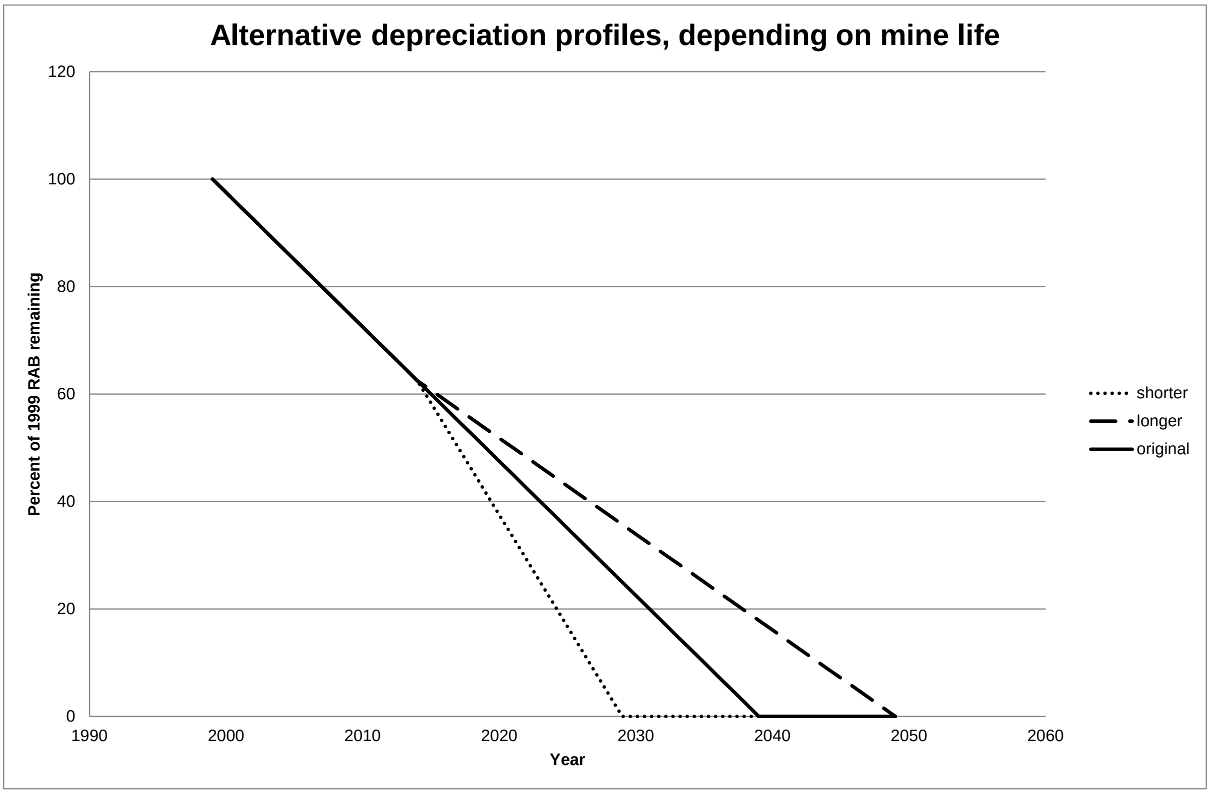
5 Implementation issues

The recommendation to increase the terminal date has practical consequences that are considered in this section.

When a terminal date is changed, care must be taken in determining depreciation charges for the remaining years to ensure that the original 1999 RAB valuation of assets is not over or under-recovered.

The correct approach is shown in figure 2 below in hypothetical terms, to illustrate the principles.

Figure 2. Alternative depreciation profiles depending on mine life



The solid line represents the original depreciation profile, assuming the original 2039 terminal date. The dotted line represents the altered depreciation profile that corresponds to an earlier terminal date. The dashed line represents the altered depreciation profile that corresponds to a later terminal date, as is proposed here.

Note that whichever one of these profiles is chosen, the original RAB value is 100% depreciated eventually, meaning that the asset owner recovers its investment exactly.

The annual depreciation values corresponding to the data in this figure are shown in figure 3 below.

Figure 3. Annual depreciation charges

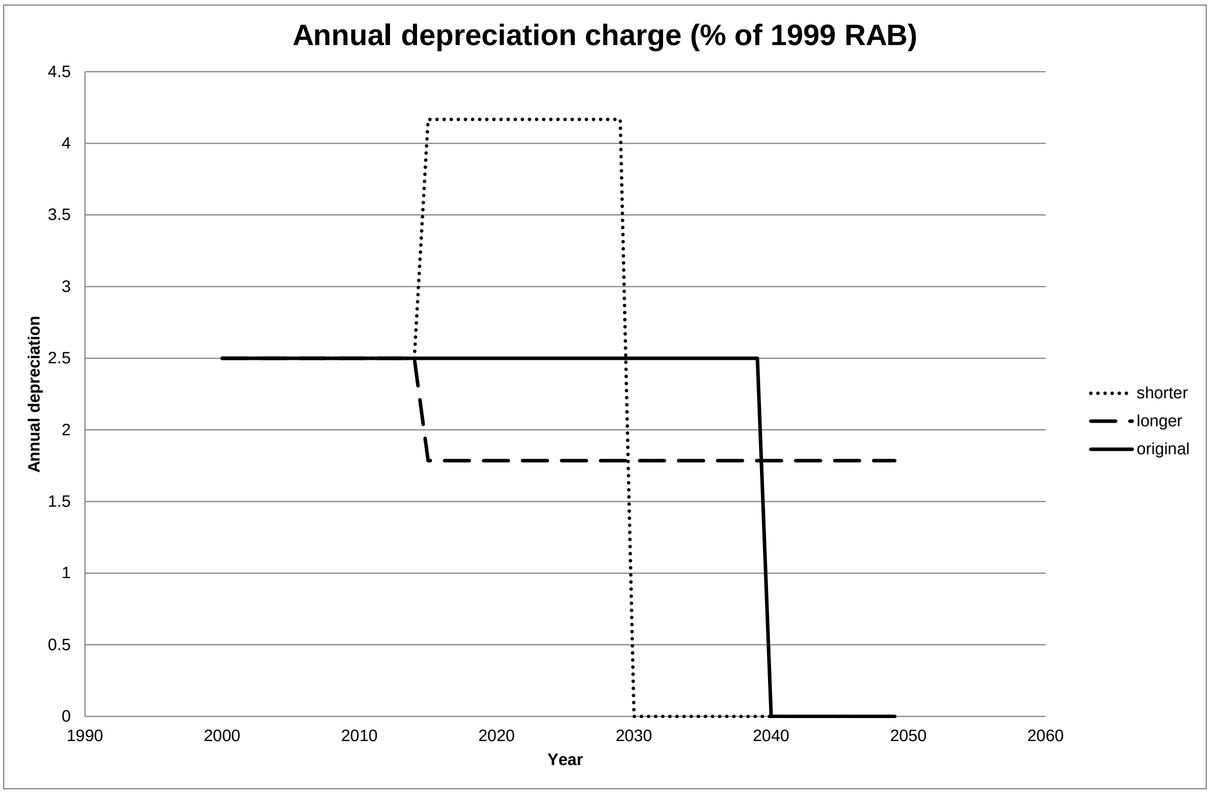


Figure 3 shows that if, in 2014, the mine life is shortened from its original value, annual depreciation rates would need to be higher until the asset is fully depreciated. Alternatively, when mine life is increased from its original value, annual depreciation rates would need to be lower, but would remain positive for longer.

It is essential that these changes to annual depreciation rates are made when the terminal date is altered. Failure to do so may cause either under or over-recovery of the original investment, as illustrated in Figure 4 below. Figure 4 shows two possible mistakes in changing mine life if the annual depreciation rate were not also changed.

Figure 4. Possible mistakes with changed terminal date

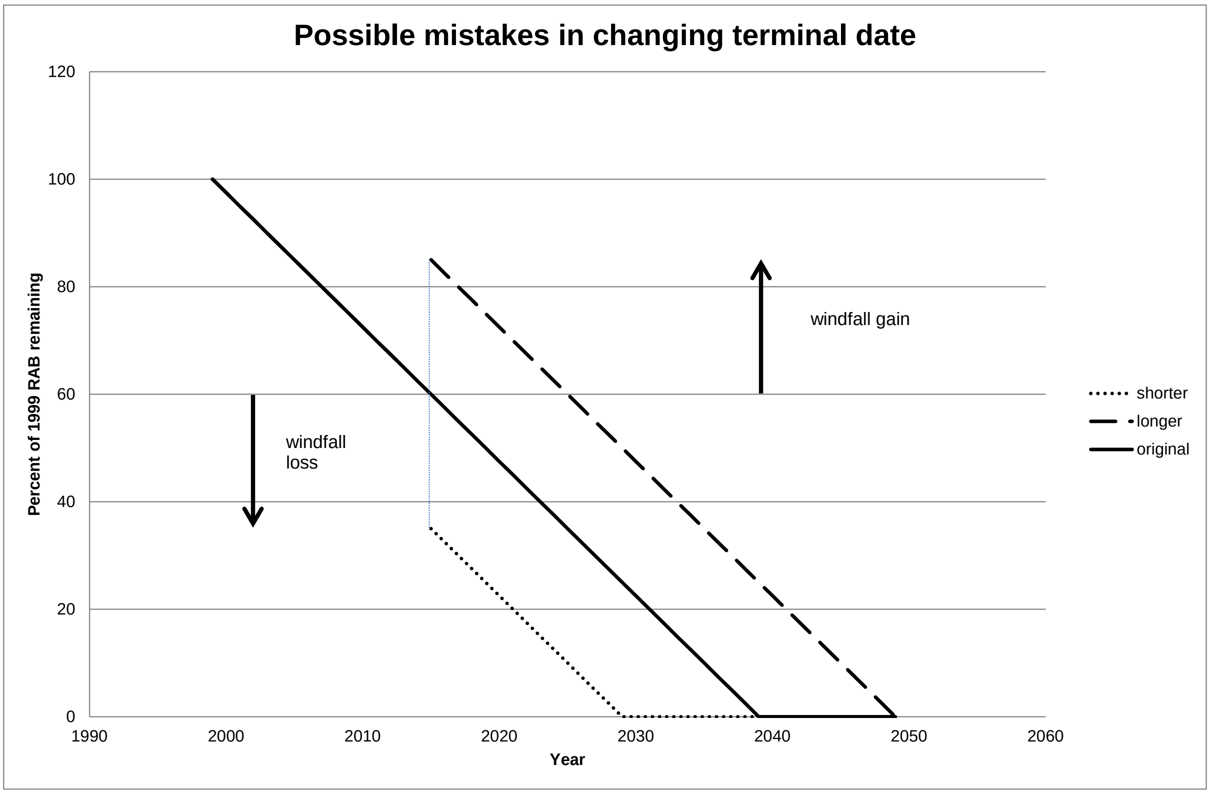


Figure 4 shows that if the annual depreciation rate is maintained at 2.5% per annum of the original 1999 RAB value, then a shorter mine life will result in a windfall loss to the infrastructure owner: the asset investment would be under-recovered. On the other hand, a longer mine life, under this mistaken depreciation policy, would result in a windfall gain to the owner: the asset investment would be over-recovered.

In summary, the proposed 4 year increase in the terminal date poses no problems in principle, as long as the future depreciation rates are modified in the manner shown in Figure 3. This will ensure exact recovery of the initial RAB over time, no windfall gain or loss to the asset owner.