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Terminal 4 Project

Submission to the preferred project report

November 2013

Rod Campbell

Richard Denniss

TAI

Submission

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Level 5, City Walk Centre
131 City Walk
Canberra City, ACT 2601
Tel +61 2 6130 0530
Email: mail@tai.org.au
Website: www.tai.org.au

Introduction

The Australia Institute welcomes the opportunity to make a submission on the preferred project report (PPR) of the Terminal 4 coal port project (T4) proposed by Port Waratah Coal Services (PWCS). The T4 project proposes to construct new coal loading and port facilities adjacent to existing PWCS facilities at the Port of Newcastle, NSW. The original proposal was for facilities capable of loading up to 120 million tonnes of coal per year. The need for a project of this size was reassessed by the proponents due to lower demand for coal export services. The size of the project has been reduced to capacity of 70 million tonnes per year and dates for commencement delayed.

Our submission relates primarily to the economic assessment of the PPR, which is based on economic assessment in the environmental impact statement (EIS) of the original project proposal. Both assessments were conducted on behalf of the proponent by consultants Gillespie Economics, a firm which has consulted almost exclusively to the coal industry for several years.[1]

It is self-evident that the economic assessment of the T4 project is flawed. The original economic assessment estimated the T4 project's net present value (NPV) at between $27 billion and $60 billion. To put this in context, Newcastle's entire housing stock is worth only $41 billion[2] and the annual economic output of the whole Hunter region is also around $41 billion.[3]

Despite Gillespie Economics estimating the project was worth such a vast amount, the proponents then reduced its capacity by nearly half and delayed it by years, demonstrating the project as originally proposed was, in fact, unviable. The economic assessment contained no hint that such an outcome was possible.

If a doctor declared a leading athlete fit to run a marathon, only to have the runner collapse on the starting line, the adequacy of the doctor's examination would be questioned. Gillespie Economics, however, have used the exact same method of examination for the PPR as they did for the EIS. Decision makers should, therefore, expect the economic assessment of the PPR to be as unreliable as the original.

The PPR economic assessment consists of a cost benefit analysis (CBA) and economic impact assessment through input output (IO) modelling. Both overstate the value of the project due to:

- Unrealistic estimates of growth in coal exports, up to twelve times actual growth rates
- Flawed scenario analysis and assessment period, including an assumption of unchanged coal exports to the year 2083

The CBA is further hampered by problems related to:

- Metallurgical coal quality and price
- Mining and transport costs
- Royalty rates and deductions

[1] See for example (Gillespie Economics, 2008a, 2008b, 2012c, 2013b, 2009a, 2009b, 2009c, 2009d, 2010, 2011a, 2011b, 2012b).
[2] Based on median house price of $600,000 and 68,733 private dwellings, sources:
http://www.censusdata.abs.gov.au/census_services/getproduct/census/2011/quickstat/11103
http://www.rs.realestate.com.au/cgi-bin/rsearch?a=sp&s=nsw&u=newcastle
[3] (Deloitte Access Economics, 2013)p81

- Tax rates and calculations
- External costs, particularly:
    - human health
    - biodiversity and
    - greenhouse gasses

We have modelled alternate estimates of the project's financial value based on more realistic assumptions. Our estimates of the net financial costs and benefits along with royalty and tax revenues for low, mid and high scenarios are provided in Table 1 below, along with the earlier estimates from Gillespie Economics:

Table 1: Modeled estimates of financial NPV, royalties and tax revenues

		Gillespie Economics EIS	Gillespie Economics PPR	The Australia Institute PPR
Total net financial benefits		($AUD millions)	($AUD millions)	($AUD millions)
	Low	$27,000	$13,000	-$795
	Mid	$58,000	$31,000	-$16
	High	$60,000	$33,000	$3,442
NSW royalties				
	Low	$4,346	$2,000	$15
	Mid	$8,128	$5,000	$552
	High	$8,473	$5,000	$1,493
Federal taxes				
	Low	$7,649	$4,000	$0
	Mid	$14,943	$8,000	$0
	High	$15,538	$9,000	$555

Note that these estimates are of financial values only. Incorporating an estimate of the externalities relating to greenhouse gasses would reduce the NPV of our "high" estimate to below zero, suggesting even under those assumptions the project is not economically efficient.

The IO modelling suffers from the flaws inherent in its assumptions:

- No resource constraints
- Fixed prices

These problems have led to much criticism of IO modelling for project assessment, recently being labelled as "biased"[4], "abused"[5] and "deficient"[6]. In fact, even under the most optimistic assumption we have modelled, based on double the historical growth rate in throughput, the project would have zero economic impact until 2023.

[4] (ABS, 2011)
[5] (Gretton, 2013)
[6] (Preston, 2013)

Review

Neither the economic assessment of the PPR nor the original EIS has been subject to independent peer review. [redacted]

Conclusion

The T4 project is unlikely to proceed under current trends due to questionable financial viability. Even if financial problems can be overcome, the external costs relating to human health, biodiversity and greenhouse gas emissions mean the project will be unlikely to deliver net benefits for either the community of NSW or at a global level. Economic impacts on the wider economy, including employment impacts are likely to be minimal.

Granting approval for the project, therefore, serves to grant the right but not the obligation to develop the project. The proponents are seeking approval not for a project which makes financial sense now, but rather to “bank” approval now in case it becomes commercial in the future when official attitudes to coal exports may be less generous. This would transfer right to decide on a project which could damage the NSW community from the public to the proponents. We recommend rejecting the project on these grounds.

Cost benefit analysis

The cost benefit analysis (CBA) in the PPR heavily overstates the value of the T4 project at global, state and national levels. Decision makers should be concerned that Gillespie Economics have applied the same methodology and assumptions to assessment of the PPR as they did to the original EIS.

It is self evident that the assumptions behind Gillespie Economics' EIS assessment are flawed. In February 2012 their assessment found the project was strongly viable, with a net present value of between $27 billion and $60 billion. Yet only months later the project was delayed and heavily downsized. Had the project's value really been in the order estimated in the EIS, the proponents would not have hesitated to continue with the project as proposed. Instead, the project now has an uncertain timetable and is around half its original size.

Despite the failure of the EIS economic assessment, Gillespie Economics have applied the exact same methodology used in the assessment of the EIS to the PPR:

> *The original analyses were revised, adjusting for the above changes [to project size and timing] but holding all other assumptions constant. It is noted that the economic assessment in Appendix R of the EA remains the primary reference document and only the updated assessment results are presented in this supplementary report. Additional background information and detail around the assessment methodology is all provided in the economic assessment in the EA.*[7]

By relying on the original assessment methodology, already shown to be inaccurate, calculated benefits are again orders of magnitude away from realistic estimates.

The cost benefit analyses in the PPR and EIS heavily overstate the value of the project due to several key assumptions and errors. We estimate the value of the project based on more realistic assumptions around:

- Assumed levels of throughput
- Scenario analysis and assessment period
- Metallurgical coal quality and price
- Mining and transport costs
- Royalty rates and deductions
- Tax rates and calculations

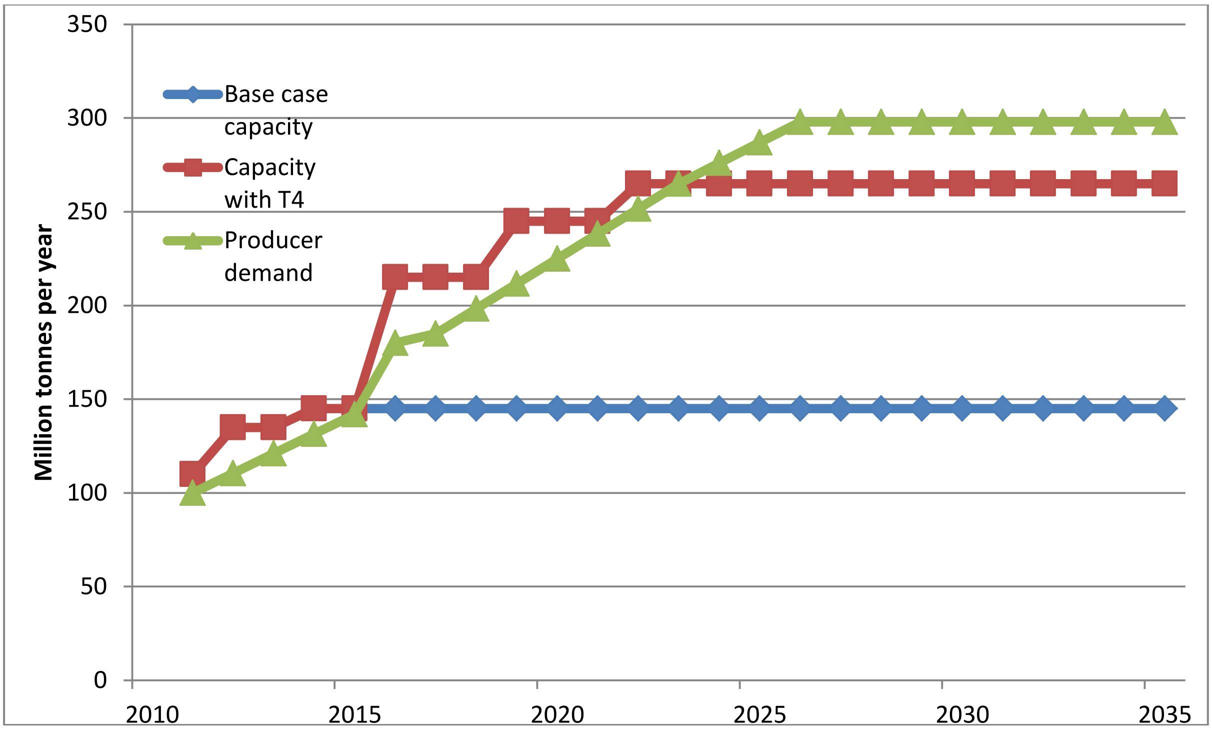
We provide a full explanation of our modelling assumptions and will provide the model on request.

Levels of throughput

A key assumption in Gillespie Economics' analysis is that the rate of coal exported through the PWCS terminal will grow at a very rapid rate, well above observed historical rates. In Figure 1 below, we have reproduced the demand forecast from which Gillespie Economics have calculated the throughput and benefits of the project and capacity estimates:

[7] (Gillespie Economics, 2013a)p7

Figure 1: EIS Appendix R figure 2.1 PWCS coal export terminal capacity and forecast producer demand

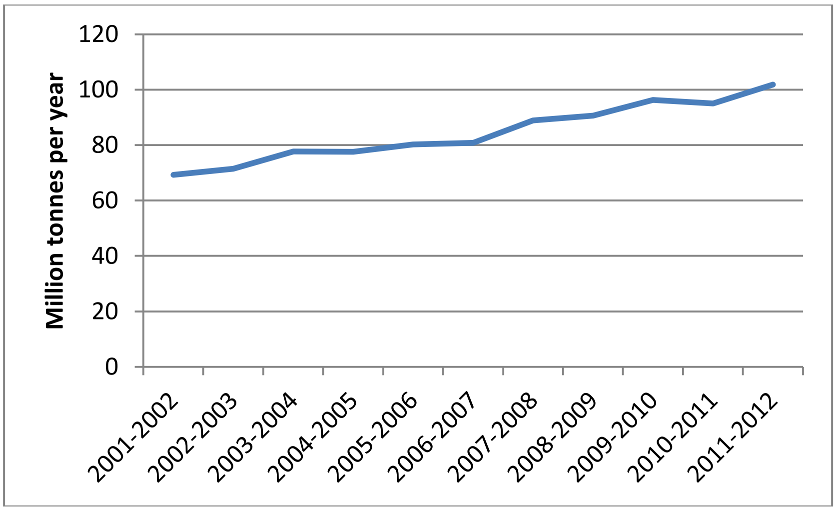


See EIS appendix R p10

Note that the growth in producer demand increases at an average of over 13.5 million tonnes per year. Between 2015 and 2016 the forecast is for an increase of around 38 million tonnes. Gillespie Economics provide no source for this forecast, no discussion of how it was derived or its accuracy. This is a surprising omission as this is one of the key inputs to their calculations of the benefits of the project.

The omission of this discussion is all the more concerning when we observe the actual trend for increase in throughput through the mining boom from 2001-02 to 2011-12. In Figure 2 below, we see that while there has been consistent growth, increases are far more sedate than forecast by Gillespie Economics:

Figure 2: PWCS actual throughput



Sources: (NSW Trade & Investment, 2013; PWCS, 2012)

Figure 2 shows that throughput has increased by an average of 3 million tonnes per year. Gillespie Economics' rate of 13.5 million tonnes per year is more than four times greater than this observed over the last ten years. In their peak year, 2015-16 Gillespie Economics assume growth will be more than twelve times the average observed trend.

The far slower rate of increase in actual throughput shown in Figure 3 would has a major impact on the need for and timing of the project. This is acknowledged by the proponents in the PPR:

> *PWCS will only build the project in response to demand…If the coal terminal is not required it will not be built. (p270)*

If the demand that is assumed by Gillespie Economics existed the T4 project would not have been scaled back in the PPR. Forecasting the rate of demand for PWCS's services is difficult and relates to the supply and demand for coal and its substitutes across the Pacific Basin:

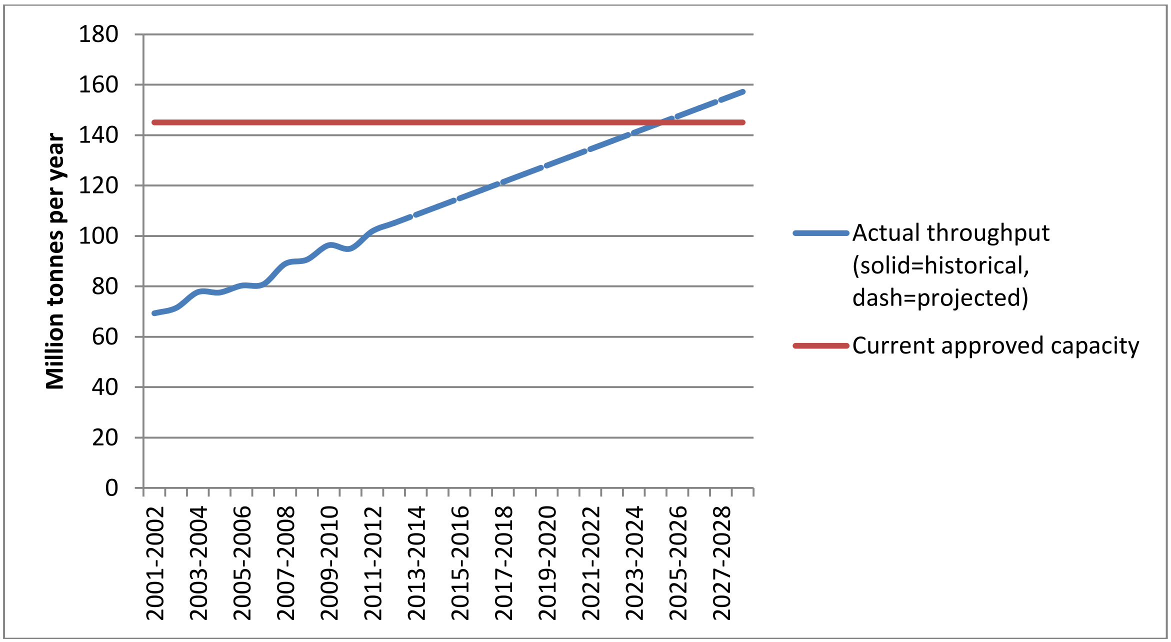
> *The policy decisions carrying the most weight for the global coal balance will be taken in Beijing and New Delhi – China and India account for almost three-quarters of projected non-OECD coal demand growth (OECD coal use declines). China's demand peaks around 2020 and is then steady to 2035; coal use in India continues to rise and, by 2025, it overtakes the United States as the world's second-largest user of coal. Coal trade continues to grow to 2020, at which point India becomes the largest net importer of coal, but then levels off as China's imports decline. The sensitivity of these trajectories to changes in policy, the development of alternative fuels (e.g. unconventional gas in China) and the timely availability of infrastructure, create much uncertainty for international steam coal markets and prices.*[8]

Gillespie Economics' assumption ignores these forecasts in changing demand and also ignores the actions of other coal producing areas. Supply from competing coal ports in Australia and other countries may also increase, reducing the demand for exports from the PWCS terminal. This is the key reason why Gillespie Economics reached the conclusion that the T4 project had a net present value of $27 billion and $60 billion in 2012, it essentially assumed that all capacity would be immediately utilised.

The actual rate of increase in throughput at the PWCS terminal is much slower than is assumed by Gillespie Economics. Over the past decade growth has averaged around 3 million tonnes per year. Figure 3 below shows the historical trend of throughput growth compared to the currently approved capacity:

[8] (IEA, 2012) p5

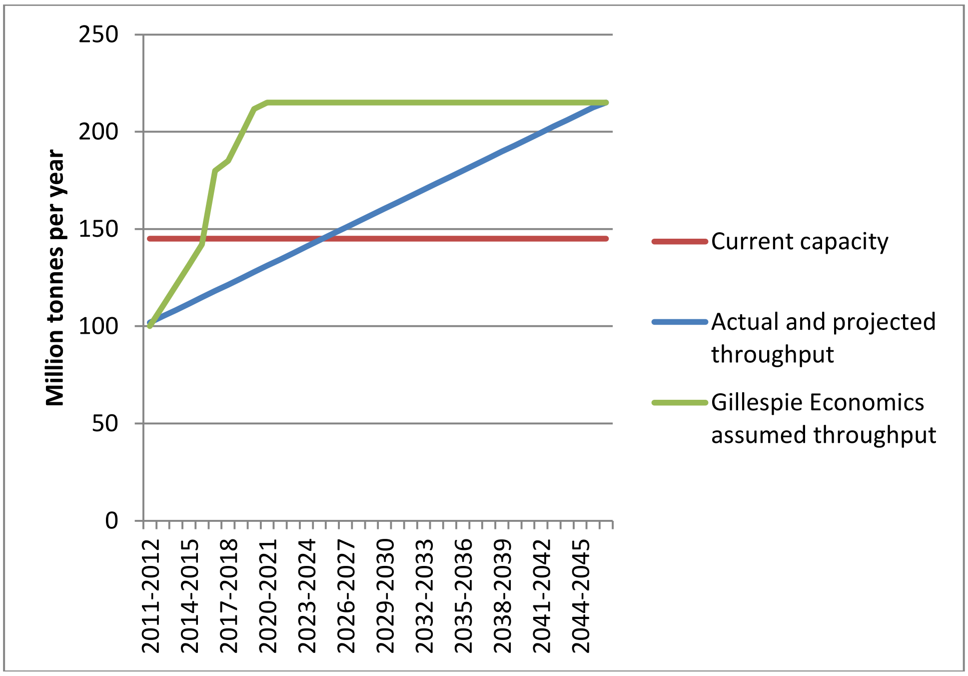
Figure 3: PWCS capacity and throughput



Source: (NSW Trade & Investment, 2013; PWCS, 2012) projection calculated as average increase over 2001-02 to 2011-12.

As shown in Figure 3, if the rate of increase in actual throughput continues on the same trajectory as over the last decade, the project will only begin to provide extra throughput and therefore financial benefit in 2025-26. By contrast, Gillespie Economics' approach assumes that the port is reaches capacity in 2016 and maximum throughput reached in 2021. They assume that throughput is continuously maintained at the maximum possible capacity throughout the assessment period. Figure 4 below shows the throughput growth assumed by Gillespie Economics in green and the historical trend in blue:

Figure 4: PWCS capacity and assumed throughput

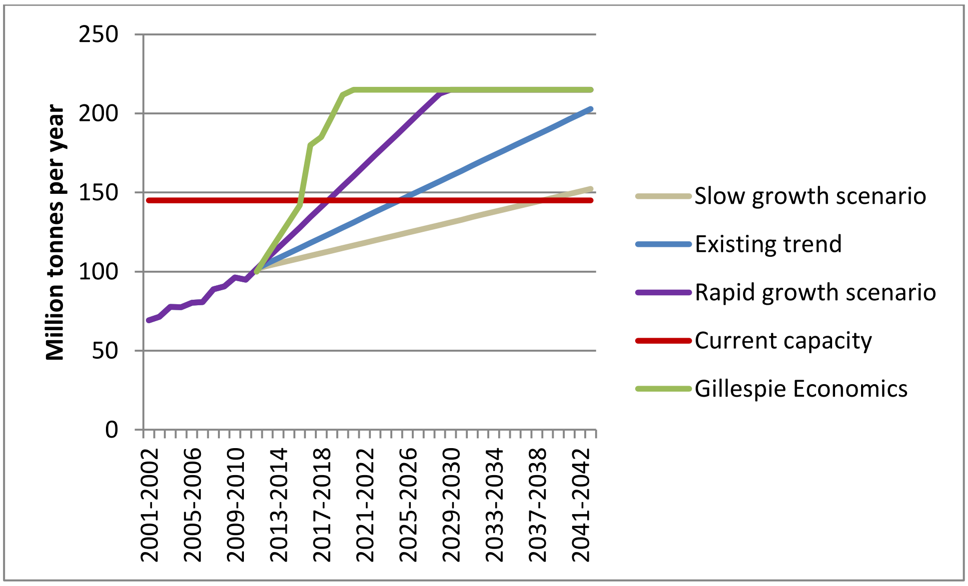


Source: (Gillespie Economics, 2012a, 2013a)(NSW Trade & Investment, 2013; PWCS, 2012) projection calculated as average increase over 2001-02 to 2011-12.

We see in Figure 4 the difference between the throughput assumed by Gillespie Economics and historical growth. The two only equate in 2046-47. Gillespie Economics' approach assumes that an extra 1,277 million tonnes of coal would be exported over this period above that indicated by the historical trend. Much of this difference is early in the assessment period. This is important as under standard CBA practices, benefits in the future are discounted. This is done to account for risks and uncertainty, our preference for benefits now rather than in the future, and the opportunity cost of engaging in this project rather than an alternative project. Benefits early in a project's life have an important influence in CBA and Gillespie Economics' approach therefore heavily overstates these early revenues from increased throughput.

As the rate of growth of coal exports is the key variable in estimating the value of the T4 project, a preferable approach is to evaluate the project at different levels of growth. Gillespie Economics' sensitivity testing does not test for changes in this key assumption. We have modelled the project under a central estimate of historical growth, a high estimate of double the rate of historical growth and a low estimate of half the rate of historical growth. Figure 5 shows these different assumptions and how they affect projected volumes:

Figure 5: PWCS capacity and throughput scenarios



Source: (Gillespie Economics, 2012a, 2013a)(NSW Trade & Investment, 2013; PWCS, 2012)

We see in Figure 5 that even if growth rates double, the volume exported will be substantially lower than that assumed by Gillespie Economics. If growth rates decline to half their recent trend, the project will only provide benefit in 2038-39.

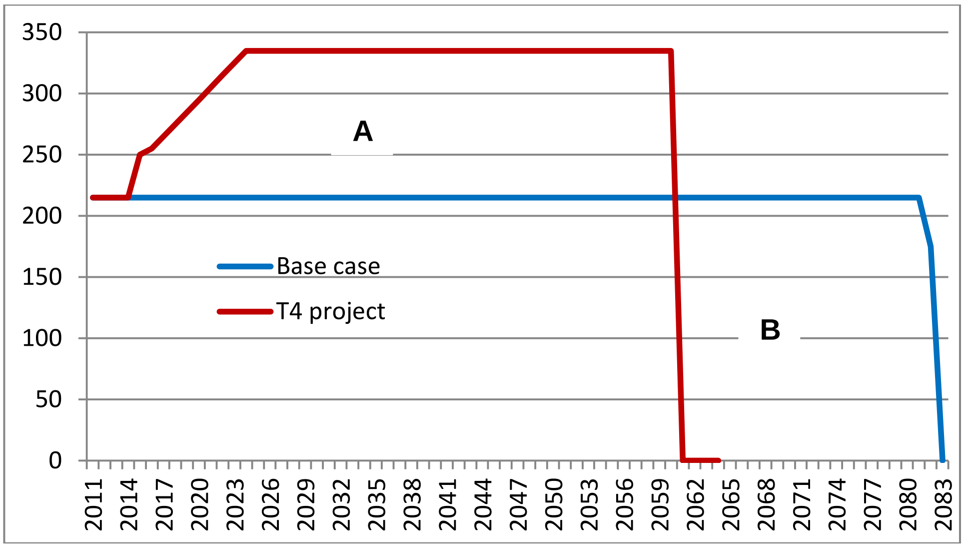
Scenario analysis and assessment period

Standard practice in cost benefit analysis is to compare a baseline "no-project" scenario with one or more "with-project" scenarios. Other factors are held constant to allow a fair comparison and evaluation of the project's merits.

In the EIS, Gillespie Economics do not adopt this standard approach. They confusingly compare no-project and with-project scenarios across different fixed sizes of the coal resource. The no-project scenario extracts the resource over a relatively long period of time, while the with-project scenario extracts the resource over a shorter timeframe.

Gillespie Economics Scenario 2 is recreated in Figure 6 below. It assumes a fixed resource of 16 billion tonnes, which would be exhausted by 2083 under the no-project scenario and 2059 in the with-project scenario:

Figure 6: Gillespie Economics scenario 2 Port of Newcastle Export Volumes 'With' and 'Without' the T4 Project

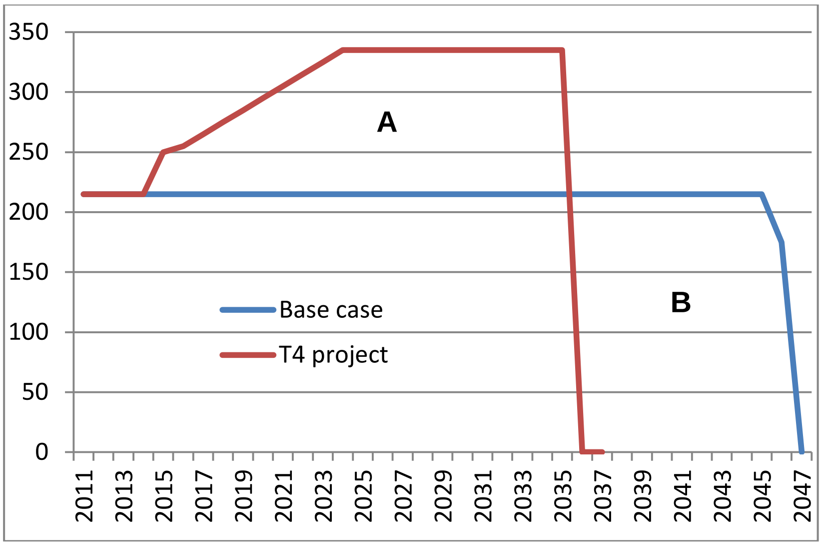


See EIS Appendix R, p11 – Note that no similar chart is supplied for the PPR, however the same assumptions have been used. Note also that this graph reflects the capacity not just of the PWCS facilities and T4 project, but of the whole Port of Newcastle, ie including the Newcastle Coal Infrastructure Group Terminal. It is not clear why Gillespie Economics alternate between showing the capacity of the whole port and of the PWCS terminals.

In Figure 6, the area under both curves represents a total of around 16 billion tonnes of coal. In calculating their estimate of project benefits, Gillespie Economics discount the net financial benefits of each scenario. As the base case extraction takes longer, it is discounted more heavily and is smaller. Figure 6 refers only to volume, rather than discounted financial value, so the size of A and B is the same, however when the present value is estimated B will be much smaller. Gillespie Economics estimate of net present value is the difference between the present value of these areas.

Figure 7 below shows Gillespie Economics scenario 1. Unlike the scenario shown above, it assumes a fixed resource of 8 billion tonnes. With a fixed resource of 8 billion tonnes, the base case takes until 2047 to exhaust the resource, while the T4 project would enable it to be exhausted by 2036:

Figure 7: Gillespie Economics, EIS Appendix R, Figure 2.2 – Port of Newcastle Export Volumes 'With' and 'Without' the T4 project



See EIS Appendix R, p11 – Note that no similar chart is supplied for the PPR, however the same assumptions have been used. Note also that this graph reflects the capacity not just of the PWCS facilities and T4 project, but of the whole Port of Newcastle, ie including the Newcastle Coal Infrastructure Group Terminal. It is not clear why Gillespie Economics alternate between showing the capacity of the whole port and of the PWCS terminals.

It is not explained why Gillespie Economics have taken the approach of assuming a fixed resource of 8 billion or 16 billion tonnes. Current and proposed projects that would utilise the PWCS facility have measured, indicated and inferred reserves of around 16 billion tonnes.[9] It seems likely that Gillespie Economics have based their scenarios on the assumption that either all or half of NSW currently recoverable coal resources will be extracted and exported. In reality a considerable amount will be used in Australia and the size of coal reserves is dependent on price, costs, new discoveries, technology and global action on climate change. Because of this we have adopted the approach of comparing with and without project scenarios over thirty years with differing levels of demand for coal export services.

Note that Gillespie Economics Scenario 3 also assumes a 16 billion tonne resource, but both with and without project options are compared over the same time frame due to:

> *technological change [resulting] in the development of alternative sources of energy at cheaper prices than coal i.e. substitution away from coal, or a policy change results in cessation of coal production. This Scenario 3 is represented simplistically as a cut off point in Figure 2.4 in year 2050 where coal ceases to be mined and exported.*[10]

While this results in a more standard comparison, it is unclear why Gillespie Economics have chosen to incorporate changing technology and policy as an abrupt halt in coal exports in 2050, rather than considering this as a factor that might slow the growth of throughput. A sudden and complete halt to coal exports following years of steady levels seems unrealistic. More likely is slower growth in coal throughput through the PWCS terminal, as discussed above and explored in our modelling of the project.

Table 2 below summarises the Gillespie Economics scenarios, in relation to resource size and assessment period:

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[9] (NSW Trade & Investment, 2013) table 1. We assume Southern, Oaklands and some Western basin reserves would either not be exported at all or shipped through Port Kembla.
[10] (Gillespie Economics, 2012a)p11

Table 2: Gillespie Economics EIS scenarios

	Scenario 1	Scenario 2	Scenario 3
Assumed fixed resource	8 billion tonnes	16 billion tonnes	16 billion tonnes
No-project	2016 to 2045	2016 to 2083	2016 to 2050
With-project	2016 to 2036	2016 to 2060	2016 to 2050

See EIS appendix R figures 2.1 to 2.3

We see in Table 2 that under Gillespie Economics' approach, their scenarios 2 and 3 evaluate the T4 project over periods out to 2083. This is inappropriate and NSW Treasury provides guidance on relevant project periods:

> *All costs and benefits attributable to a project should be included in the evaluation and hence the period covered by the evaluation needs to be long enough to capture them. The appropriate determinant of the project period will normally be the assessed economic life of the major asset involved in the investment proposal. Once a project period of, say, 20 years has been reached, the analysis will be relatively insensitive to the choice of a longer project period due to the discounting of future costs and benefits. In view of this and the difficulty of forecasting costs and benefits over such long periods, caution should be exercised in adopting a project period, longer than 20 years. Certainly the project period should not exceed 30 years.* [11]

Metallurgical coal price

Gillespie Economics correctly identify that around 20 per cent of NSW coal exports are of metallurgical coal, mainly used for making steel. They then use a real price of $200[12] per tonne in estimating the benefits from increases in exports from the T4 project. This is incorrect. The vast majority of NSW metallurgical coal exports are of low grade "semi-soft coking coal" rather than high quality hard coking coal, most of which is exported from Queensland's Bowen Basin. Even Gillespie Economics' original source[13] listed the value of lower quality metallurgical coal as $164/t, while more recent estimates have lower prices, around $118/t.[14] By using incorrect metallurgical coal prices, Gillespie Economics overstate the value of the T4 project.

Mining, transport costs

While expanding coal exports would increase revenue, it is also essential to consider mining costs to estimate the net benefits of the project, royalties and tax revenue. Gillespie Economics claim that "published data in this area is limited"[15], however coal analysts such as Platts and Wood Mackenzie publish estimates regularly. Other analysts also publish research based on the work of these research houses, our analysis is based on Wood Mackenzie data.[16]

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[11] (NSW Treasury, 2007) suggests project evaluation periods should not exceed 30 years, see p39
[12] This appears to be the AUD price, although it is not specified and coal prices are usually quoted in USD, see EIS Appendix R p15
[13] (ABARES, 2011)p19
[14] (BREE, 2013)p62 (CBA, 2013)
[15] EIS appendix R p14
[16] as reported in (Morgan Stanley, 2013)

Gillespie Economics' sources consist of 2009 data from an American consultant's presentation to a coal industry conference[17] and an accountant's assessment of a takeover offer for a single coal company, Centennial Coal. [18] These are not appropriate sources – neither reflect changes which have occurred since 2009 and one is based on a single company – Centennial Coal. According to another of Gillespie Economics' cited references[19] Centennial Coal had the lowest costs per tonne of the companies analysed.

Gillespie Economics estimate of free on board cash costs of USD$60/t are, therefore, heavily optimistic. Most Australian thermal coal mines have operating costs of between USD$70 and $90 per tonne, with a median value of USD$80.[20] This includes mining costs, royalties, coal preparation, transport and port charges. In our model we have used this median value, and an exchange rate of 0.88[21] to give an AUD price of $90.91/t. Coal exports are of course highly sensitive to exchange rate changes. A long-term trend towards a higher exchange rate would likely push the value of the project towards our slow-growth scenario, while rates below 0.88 would increase the value towards the rapid-growth scenario.

Gillespie Economics are correct to deduct royalties from costs for public cost benefit analysis, as they represent a transfer between parties rather than a cost of production. Our modelling also follows this approach.

We take a different approach to Gillespie Economics who include a capital cost per tonne for port and rail development and then deduct port and rail costs should be deducted from free-on-board costs. By leaving these costs unadjusted, they reflect the resources involved in transporting and loading coal along with some return to transport companies and allowance for their future investment.

Royalties

Royalty calculations and the assumptions behind them should be given close scrutiny in the assessment of the T4 project. As the NSW coal industry is largely owned by foreign corporations, the benefits to NSW consist largely of royalties. Decision makers should be concerned by the lack of detail in royalty discussion in the PPR. It is worth noting that NSW Treasury have also been critical of the non-transparency of Gillespie Economics' work on other projects:

> *The characteristics of a good quality CBA include transparency and repeatability, with assumptions and methodology clearly identified, and rigorous sensitivity testing. Unfortunately in the paper available to us, the Gillespie Economics analysis does not clearly detail the inputs and assumptions used in its calculations, making the testing of assertions more difficult.*[22]

Gillespie Economics estimate an average royalty of $9.64/t[23]. It is not clear how this has been estimated or even if it is in Australian or US Dollars. While their reported royalty rates of 7.2 per cent for underground mines and 8.2 per cent for open cut mines are correct, it is

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[17] (Devon, 2010)
[18] Referenced by Gillespie Economics as Ernst and Young (2010) Independent Expert's Report and Financial Services Guide: In relation to the takeover offer for all of the shares of Centennial Coal Company Limited. We have been unable to locate this analysis.
[19] (Barnett, 2010)
[20] (Morgan Stanley, 2013)p36
[21] (CBA, 2013)
[22] (NSW Treasury, 2013)p6
[23] EIS appendix R p14

unclear if they have allowed for any of the allowable deductions from royalties payable relating to:

- Beneficiation
- Coal Research Levy
- Mine Subsidence Levy
- Mines Rescue Levy
- Long Service Leave Levy
- Insurance
- Bad debts
- Bank commissions

We have assumed a $3.50 per tonne deduction for beneficiation but no other deductions.[24]

Our other assumptions for use in royalty calculations are:

- 20 per cent of production is metallurgical coal – semi soft coking coal – while 80 per cent is Newcastle benchmark thermal coal.
- Production comes initially from 70 per cent open cut and 30 percent underground, changing over 5 years to 80 percent open cut and 20 percent underground.[25]
- Metallurgical coal and thermal coal production are split among underground and open cut projects in the ratios above.

Gillespie Economics make no explanation of their federal tax calculations. This should be of concern to decision makers as there is a significant difference in the theoretical and effective tax rates paid by mining companies in Australia due to various deductions, exemptions and rebates.[26] We adopt an effective federal tax rate of 13.9 per cent.[27]

[24] (NSW DII, 2008)
[25] This follows the trends outlined in (NSW Trade & Investment, 2013). We assume this then remains constant for the remainder of the assessment period. Calculations available on request.
[26] (Richardson & Denniss, 2011)(Markle & Shackelford, 2009)
[27] (Richardson & Denniss, 2011)

Revised modelling of T4 project

A summary of our modelling assumptions, mainly discussed above, is listed below:

Table 3: The Australia Institute T4 model assumptions

Variable	Unit	Values	Notes	Source
Actual throughput	Million tonnes per year	105 to 215	Rising at rate observed from 2001-02 to 2011-12. Other scenarios are half and double this observed trend.	NSW Dpt Trade and Investment 2013 and PWCS 2012
Throughput capacity	Million tonnes per year	145 to 215	PPR increase	PPR
Metalurgical coal proportion	Per cent	20%	20 per cent of production	NSW Dpt Trade and Investment 2013
Thermal coal proportion	Per cent	80%	80 per cent of production	NSW Dpt Trade and Investment 2013
Met coal price	real USD/t	104	Assuming all production is semi soft coking coal	CBA 2013
Exchange rate	AUD:USD	0.88		CBA 2013
Thermal coal price	real AUD/t	100	real AUD $100/t	EIS appendix R
Average costs per tonne	real USD/t	80	Includes mining, transport, royalties	Morgan Stanley 2013
Underground proportion	per cent	30% to 20%	Declines at rate observed 2008-09 to 201112	NSW Dpt Trade and Investment 2013
Open cut proportion	per cent	70% to 80%	Increases at rate observed 2008-09 to 2011-12	NSW Dpt Trade and Investment 2013
Underground royalty rate	per cent	7.20%	Assumes no deep underground production	NSW DII 2008
Open cut royalty rate	Per cent	8.20%		NSW DII 2008
Allowable deductions	real AUD/t	3.5	Assumes only beneficiation from a full wash cycle deducted	NSW DII 2008
Capital costs	real AUD, millions	4,800	Incurred when capacity exceeded (2025-6) in mid case, spent over 3 years	EIS appendix R
Effective tax rate	Per cent	13.90%	Incorporates all deductions	Richardson and Denniss 2011
Discount rate	Per cent	7%		EIS appendix R

Under these assumptions and the slow, observed and rapid growth scenarios, we estimate the net present value of the project as follows:

Table 4: The Australia Institute T4 model results summary

	The Australia Institute PPR
Total net financial benefits	(AUD millions)
Existing growth trend	-$16
Low growth	-$795
High growth	$3,442
NSW royalties	
Existing growth trend	$552
Low growth	$15
High growth	$1,493
Federal taxes	
Existing growth trend	0
Low growth	0
High growth	$555

Full model available on request

Discussion

The implication of these results is that at current growth rates in throughput the project is not financially viable and will not proceed. To become viable it relies on a considerable increase, sustained through the 30 year project period. While some increase may occur under the current round of project approvals, there is great uncertainty around whether this level could be maintained over the 30 year assessment period as changes in policy relating to coal use and changing technology in substitute energy sources affect the seaborne trade.

While our modelling shows positive values for royalty increases and federal tax revenues under the central and low growth cases, these are unlikely to be realised as the project will struggle to proceed financially.

External costs

The CBAs in the PPR and EIS make no attempt to value the external costs associated with the project. This is contrary to NSW guidelines:

> *A CBA framework is focused on the aggregate social welfare of the community. It should take account of the full range of potential benefits and costs of particular actions, including environmental, health and other social impacts as well as economic impacts of particular proposals. It is not appropriate to examine only some types of impacts in isolation.*[28]

Clearly, increasing the amount of coal mined and transported through Newcastle would have significant impacts on air quality and human health, native vegetation and biodiversity and

[28] (NSW Treasury, 2012)p1

greenhouse gas emissions, both related to mining and to expanded use of thermal coal in global electricity generation.

Health

The mining cost estimates discussed above make no consideration of external costs such as reduced air quality and associated damage to human health. The CBA therefore understates the costs of the project and overstates its value to the NSW community. External impacts such as health can be measured and quantified in economic terms as noted in an earlier Gillespie Economics report:

> [C]*ertain kinds of social impacts, such as social dislocation or adverse health effects, may be partially appraised in monetary terms.*[29]

Such appraisal would be assisted by NSW Department of Health research looking at morbidity and mortality in regions of the Hunter Valley affected by mining.[30] They found that the regions in the Hunter most affected by mining have higher rates of emergency department attendances for asthma and other respiratory conditions; hospital admissions for respiratory conditions and cardiovascular disease and mortality due to cardiovascular disease and all cause mortality. Analysis of presentations to GPs also suggested higher rates of asthma and other respiratory conditions in communities affected by mining, although not statistically significant.[31]

There are significant limitations to these studies, including that they do not adequately take account of other population factors affecting health in these areas, and that the number of people in the affected areas are small, making comparisons difficult. However, both studies confirm the work of others, showing that exposure to pollutants, particularly particulate matter is an important causative factor in respiratory and cardiovascular disease. It is also well recognised that there is no threshold level for negative health impacts of particulate pollution. There will be people affected by particulate air pollution and this must be acknowledged.

Air monitoring data from the mines in the Hunter region revealed high levels of PM10 particles in a number of sites.[32] However, as acknowledged by the Dept of Health, there is insufficient monitoring in populated areas. If those data were available, this would enable a better prediction of the cumulative health impact of the mining activities in the region.[33]

In the USA quantification of the health impacts of coal is more advanced. A prominent paper claims that coal fired power generation imposed external costs up to 5 times greater than its value added, mainly through health impacts.[34] Other researchers estimate that the cost of lives lost in the Appalachian mining region in the US is US$74.6 billion per year.[35] This builds on other research which found "[a]ge-adjusted mortality rates were higher every year from 1979 through 2005 in Appalachian coal mining areas compared with other areas of Appalachia or the nation".[36]

While it is difficult to extrapolate the health impacts of coal mining in the USA to the Australian setting due to different mining practices and different pollutant levels, it is clear

[29] (Gillespie & James, 2002)p21
[30] (NSW Health, 2010a)
[31] (NSW Health, 2010b)
[32] (NSW Department of Environment Climate Change and Water, 2010)
[33] (NSW Health, 2010a)
[34] (Muller, Mendelsohn, & Nordhaus, 2011)
[35] (Epstein et al., 2011)
[36] (p.547)(Hendryx & Ahern, 2009)

that there are considerable impacts. It is important that the costs associated with impacts are included in consideration of this project. Clearly these are costs that accrue to the local and NSW community and should be included in the assessment.

Native vegetation and biodiversity

Many new coal projects are expanding into areas of considerable ecological value. These values are not considered in the estimates of mining costs discussed above, or in the EIS or PPR. Estimating these values in monetary terms is difficult and subjective and studies commissioned by mining proponents have been found to underestimate these values. Examples include the Warkworth project and the Maules Creek coal project:

> *I am not satisfied that the economic analyses provided on behalf of Warkworth support the conclusion urged by both Warkworth and the Minister, namely that the economic benefits of the Project outweigh the environmental, social and other costs.*[37]

> *The Commission has noted in response that narrowly-based cost-benefit analyses of the kind usually undertaken for coal mining projects are unlikely to ever value any single environmental attribute or feature above the value of the coal that would have to be foregone to protect it. The Commission's view is that such assessments should therefore be approached with extreme caution rather than being uncritically accepted as justifying propositions for destruction of significant natural features. The techniques available for placing an economic value on natural features are still relatively crude and, in the Commission's view, their application usually falls well short of the standard required to withstand rigorous scrutiny.*[38]

Furthermore, the project is proposed to expand through wetland areas considered significant for threatened species such as the green and golden bell frog.

Decision makers need to consider that any financial benefits that may derive from the more optimistic scenarios for coal throughput will be offset in some cases by damage to native vegetation and biodiversity. The result of this damage will be borne primarily by the local community while most benefits are directed towards overseas shareholders.

Greenhouse gas emissions

It is unclear from the analysis of Australian coal mining costs whether this includes consideration of carbon tax liabilities. If not, the financial and environmental costs of mine expansions associated with the T4 project would be understated.

Of far greater importance, however, are costs relating to the increases in global coal usage that the project may cause under the more optimistic throughput growth scenarios. Coal industry economists, including Gillespie Economics, argue that:

> *[The] definition of the Project for which approval is being sought has important implications for the identification of the costs and benefits of the Project. Even when a [CBA] is undertaken from a global perspective and includes costs and benefits of a*

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[37] (Preston, 2013)
[38] (PAC, 2012a)

> *Project that accrue outside the national border, only the costs and benefits associated with the defined Project are relevant.*[39]

In their assessment of the PPR however, Gillespie Economics do not adopt this approach. The defined project for which approval is being sought in this case relates only to infrastructure to facilitate the loading of coal. The narrowly defined costs of what is being proposed consist only of construction and operation of loading facilities, the benefits would be only the revenues accruing for these loading services, around AUD$5 per tonne.[40] Following this approach would result in project values only a fraction of what Gillespie Economics estimate.

Instead, Gillespie Economics expand their definition of the project considered to include the costs and benefits of upstream mining activities. All costs and benefits associated with the expansion of mining operations which the project may trigger are included. Gillespie Economics fail, however, to include in their assessment the costs and benefits of changes to the level of coal consumption that the project may bring.

Benefits of an expansion in coal consumption resulting from the project are included – these are reflected in the price customers pay for the coal. Costs relating to impacts on the world's climate are not reflected, however, as consumers are generally not required to bear this cost. This results in an overstatement of the value of the project.

Under the more optimistic throughput assumptions, the project will cause a small increase in the amount of coal used in the world. Coal industry proponents often adopt the "drug dealer's defence" – that if we did not sell the coal/drug to the users, someone else would, and our actions therefore make no difference. This is true to a large extent - most coal that would be consumed in the world would be substituted from other mines, but not all of it. The expansion of the coal supply that the project represents will exert some downward pressure on prices which will result in an increase in the amount demanded.

In the absence of the project, not all of the coal exported would be offset by production in other mines. To argue otherwise is to suggest that coal supply is perfectly elastic and therefore that coal price should not vary. This is clearly not the case. Some estimate of this effect can be made from published sources and consideration of the price elasticities of supply and demand for coal. The standard analysis gives the equilibrium effect on aggregate quantity by the project as $\Delta(-\varepsilon/(-\varepsilon+\eta))$ where:

Δ is the initial change in supply

ε is the elasticity of demand

η is the elasticity of supply

The elasticity of demand for coal is estimated at -0.3[41]. Estimates of the elasticity of supply vary widely and are also frustratingly out of date. International authors cite a range of estimates from 0.3 to 2.0 and conclude that the best estimate is around 0.5[42].

Applying these estimates to the changes in global coal supply that would result under the higher throughput scenarios results in a present value of CO2 emissions of $6,326 million, considerably higher than the financial NPV of the project.[43]

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[39] (Bennett & Gillespie, 2012)
[40] (Morgan Stanley, 2013)
[41] There seem to be no more recent estimates from ABARE/BREE than (Ball & Loncar, 1991)
[42] (Light, Kolstad, & Rutherford, 1999)

This approach is, of course, strictly in line with cost benefit analysis methodology in considering the marginal impacts of a particular project. Strong arguments exist for taking a stronger stand on moral and political grounds to address excessive fossil fuel use and climate change. Interestingly, in Washington State, USA, state government agencies are now beginning to include downstream emission as a part of project assessment processes. The Washington Department of Ecology is using its state environmental policy act to broaden the scope of its assessment beyond state and national boundaries. See:

- http://www.eisgatewaypacificwa.gov/
- http://www.ecy.wa.gov/news/2013/238.html

[43] Assumes CO2 social damage cost of real AUD$23/tonne, in line with original Australian carbon tax value, growth in PWCS throughput volumes of twice observed trend 2001-02 to 2011-12 and a discount rate of 7%. Modelling available on request

Input output modelling

Gillespie Economics use a modelling approach called input-output (IO) modelling. IO models estimate the "flow on" or "downstream" economic impacts of a project or policy on other industries - ie that when one industry spends more money or employs more people, it buys things from other industries which increases their output, in turn increasing activity in yet more industries and so on. These effects are estimated through "multipliers" which are higher or lower depending on the degree to which the analyst believes industries are integrated.

Using this method, Gillespie Economics estimate impacts of:

- $819m in annual direct and indirect output;
- $613m in annual direct and indirect regional value added;
- $61m in annual direct and indirect household income; and
- 723 indirect jobs.[44]

The results of the economic impact assessment in the PPR are misleading due to two key flaws:

- They are based on unrealistic rates of throughput – ie the assumption that throughput will equal capacity throughout the project period, as discussed in the CBA section.
- The assumptions inherent in input output models mean "They always produce a positive gain to the economy, however disastrous the event".[45]

Throughput assumptions

It is clear from Figures 1 to 7 in the PPR Appendix S that the economic impact assessment assumes that the project will be constructed to full capacity over 4 years and that throughput will quickly reach full capacity which will be maintained throughout the assessment period.

In regards to the construction phase, this assumption is "for modelling purposes only" and ignores the more likely gradual staging of the project:

> *The project will be progressively constructed in response to demand, rather than in the three main stages assumed previously. For modelling purposes only, construction is assumed to start approximately two years later than assumed in the EA, with first coal shipped at the end of 2017 (indicative) rather than the end of 2015. However, staging and size of staging is subject to project approval, demand and commercial requirements.*[46]

In regard to the operational phase, the assessment ignores the observed trends in actual throughput at the PWCS facilities and adopts the unrealistic assumption that full capacity will be immediately reached and indefinitely maintained. As discussed above, If growth of throughput continues at the rate of the last decade, there will be no economic impact of the project at all until 2023-24 when existing capacity is neared and construction would begin. Impacts would grow along with throughput growth at a rate far slower than Gillespie Economics assume, under the assumptions of the type of model used, input-output modelling.

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[44] (Gillespie Economics, 2013a)p12
[45] (Abelson, 2011)
[46] PPR Executive summary (EMGA Mitchell McLennan, 2013)pE.2

Input output models

While IO modelling has been common in Australia for many years, this does not reflect on its reliability and accuracy. Economists and public institutions have criticised its use for many years. The ABS stopped publishing IO multipliers in 1998-99 as the data was mostly used to support “bids for industry assistance”. The ABS details the shortcomings of this “biased estimator of the benefits or costs of a project” [47]:

> ***Lack of supply–side constraints:*** *The most significant limitation of economic impact analysis using multipliers is the implicit assumption that the economy has no supply–side constraints. That is, it is assumed that extra output can be produced in one area without taking resources away from other activities, thus overstating economic impacts. The actual impact is likely to be dependent on the extent to which the economy is operating at or near capacity.*
>
> ***Fixed prices:*** *Constraints on the availability of inputs, such as skilled labour, require prices to act as a rationing device. In assessments using multipliers, where factors of production are assumed to be limitless, this rationing response is assumed not to occur. Prices are assumed to be unaffected by policy and any crowding out effects are not captured.*

For an example of the ABS’s first point, IO analysis assumes there is no “constraint” to the amount of construction labour available in Newcastle or of mining workers in mining areas served by PWCS. They assume that there is a large “ghost workforce” of skilled construction and mining workers ready to work on the project and expanded mines who will not be taken away from some other project either in the Hunter Valley or in NSW more broadly.

The ABS’s point about fixed prices refers to the assumption that the new demand for inputs such as construction workers can be satisfied without increasing their wages. This is clearly unrealistic, as mining wages have increased considerably during the mining boom as is regularly emphasised by the mining industry.

Wariness about the application of IO modelling to project applications is not limited to the ABS. A recent Productivity Commission research papers describes the Commission’s concern about “well recognised abuses” over several decades[48]:

> *The lack of accounting for the opportunity costs in input-output multiplier analysis has resulted in persistent expressions of concern over many years regarding the applicability of multiplier analysis in a public policy context. As noted, a common focus of the concern is on the use of multipliers to make the case for government intervention (either to preserve prevailing output or employment under threat or to support the set up or expansion of a designated activity).*

The economic assessment of the Warkworth expansion project also relied on IO modelling, which was criticised by Preston CJ[49]:

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[47] (ABS, 2011)
[48] (Gretton, 2013)*p10*
[49] (Preston, 2013)

> *The IO analysis is a limited form of economic analysis, assessing the incremental difference in economic impacts between approving or disapproving the extension of the Warkworth mine. The deficiencies in the data and assumptions used affect the reliability of the conclusions as to the net economic benefits of approval. More fundamentally, however, the IO analysis does not assist in weighting the economic factors relative to the various environmental and social factors, or in balancing the economic, social and environmental factors. (p155)*

> *The IO analysis assumes that there are unemployed resources available within the Hunter region to meet any increase in workforce demand, and that the workforce will not be drawn away from any other activity. I accept [The Australia Institute's] evidence that the assumption of the IO model that there is a ghost pool of highly skilled yet unemployed people in the Hunter region, from which labour for the extension of the existing mine would be drawn, is unrealistic. I accept [the Institute's] evidence that, to a considerable extent, employment generated from the extension of the Warkworth mine would involve currently employed skilled workers transferring from other industries, but the vacancy thereby created in the other industries may not necessarily be filled, partly because of a shortage of skilled workers and partly because the remuneration is inferior to that offered in the mining industry. (p159)*

Preston CJ is not alone in his criticisms. Following his decision, coal industry major Yancoal reassessed the IO modelling of their Ashton South East Open Cut project, also facing an appeal before the Land and Environment Court. Yancoal commissioned ACIL Allen to review the IO modelling and to re-evaluate the project's impacts using another model[50]:

> *[In] the Warkworth case IO modelling was criticised by the chief judge and ... for good reason. [This] modelling is fine for some purposes but it's not the best technique … for this kind of purpose [project evaluation]. The reason is that IO modelling takes no account of the fact that there are limited productive resources [in the economy] principally people to be employed. So it always makes the amount of output, income, jobs, bigger than would likely be the case, unless you're in the Great Depression, or a very deep recession.*

Instead of IO modelling, ACIL Allen used more sophisticated computable general equilibrium (CGE) modelling to assess the project. They estimated that while the Ashton project would employ 162 people, local employment would increase by only 78. This means that 84 jobs in other projects and industries are "destroyed" at a local level. At a state level, downstream jobs estimated by Yancoal were only 2 jobs greater than the direct employment number of 162. (See court transcripts)

Because of the flaws inherent in IO modelling counsel for the Minister for Planning has dropped the earlier IO modelling of that project from their case and rely on Yancoal's CGE modelling.

In summary, the economic impacts of the approving the project are likely to be zero until 2023 unless there is a change in the rate of increase in coal throughput. Furthermore, decision makers should be sceptical of IO modelling results. While the project proposes to employ on average 80 people once fully operational, many of these will come from existing positions, delaying and crowding out other projects rather than "creating" new jobs. Claims of construction employment similarly result not in large increases in new jobs, but in reallocation and prioritisation of existing positions.

[50] *(see court transcripts, p546)*

Independence of assessment and review

Appendix R of the EA and Appendix S of the PPR have been conducted by Gillespie Economics, a firm which has consulted almost exclusively to the coal industry for several years.[51]

In the EIS, the proponents claim that the original economic assessment was “independently peer reviewed” by Professor Jeff Bennett of the Australian National University.[52] [redacted]

[redacted]

> [redacted]

[redacted]

> [redacted]

[redacted] We recommend a genuinely independent review of both economic assessments.

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[51] See for example (Gillespie Economics, 2008a, 2008b, 2012c, 2013b, 2009a, 2009b, 2009c, 2009d, 2010, 2011a, 2011b, 2012b).
[52] p239
[53] https://crawford.anu.edu.au/people/academic/jeff-bennett
[54] (Bennett & Gillespie, 2012)
[55] For example (Gillespie & Bennett, 2012)
[56] (Bennett, 2012)p180.
[57] (Preston, 2013)
[58] (PAC, 2012b)

Conclusion

The economic assessment of the T4 PPR is fundamentally flawed. This is self-evident as it is based on the assumptions that predicted huge values from the original project only to see it delayed and downsized. Despite Gillespie Economics' claims of net present value of between $13 billion and $33 billion, the NPV under our mid assumptions is negative $15 million.

The key flaws in Gillespie Economics assessment relate to:

- Unrealistic estimates of growth in levels of port throughput
- Flawed scenario analysis and assessment period
- Metallurgical coal quality and price
- Mining and transport costs
- Royalty rates and deductions
- Tax rates and calculations
- External costs, particularly:
    - human health
    - biodiversity and
    - greenhouse gasses

The input output model results are also heavily overstated due to growth assumptions and the biases inherent in that form of modelling when applied to project assessment.

The project is unlikely to provide net benefits to the NSW community or the world at large. To achieve even financial viability requires a considerable increase in the outlook for coal exports. Granting approval for the project would serve only to transfer the decision to proceed with this potentially welfare-reducing project from public to private hands. We strongly recommend against recommending the T4 project.

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