The
CIE

Peer review of economic assessment

Wallarah 2 Coal Project

Prepared for
NSW Department of Planning and Environment

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THE CENTRE FOR INTERNATIONAL ECONOMICS
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Contents

Summary

The Wyong Areas Coal Joint Venture (WACJV) is seeking development consent under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the Wallarah 2 Coal Project (the Project). An economic assessment of the Project has been prepared by Gillespie Economics (dated May 2016) and presented in Appendix J of the EIS documentation prepared by Hansen Baily for the WACJV. A peer review (conducted by BDA Group) of the economic assessment was also commissioned by the proponent. The CIE has been engaged by NSW DPE to peer review the economic assessment presented.

The CIE's review tests the reasonableness of the CBA undertaken by Gillespie Economics and its consistency with NSW Government guidelines in relation to undertaking CBAs. Gillespie Economics has drawn on the NSW Treasury (2007) *Government Guidelines for Economic Appraisal* and the NSW Government (2015) *Guidelines for the economic assessment of mining and coal seam gas proposals*.

In general we conclude that the CBA has been undertaken in a manner that is broadly consistent with the 2015 NSW Government guidelines for conducting mining related applications and the 2007 Guidelines for economic appraisals.

While the analytical approach is broadly consistent, the individual components and parameter estimates warrant testing. Some of the estimates are difficult to test, particularly where there is limited publicly available data on, for example, the cost of the mining operations. Further, the CBA requires Gillespie Economics to develop assumptions regarding future factors, such as the future price of coal which can change significantly depending on global market conditions.

Given this, for our review, we have focused on the key factors that drive the results and can be readily tested. On the benefits side, *at a minimum*, the NSW Government would receive royalty payments. On the cost side, there are a range of externalities that need to be accounted for. In some instances, these externalities have been mitigated (in full) by the actions of the company. However, there are instances where there are residual impacts that are not fully mitigated. We have relied on the findings presented in the EIS documents and NSW Government agency submissions to the process to understand whether these impacts are likely to be material and would change the conclusion regarding the quantum of net benefits.

Table 1 presents Gillespie Economics estimates of the net benefits as well as an alternative lower bound estimate of the net benefits to the NSW community. The lower bound estimate presented in the table is based on the assumption that the only benefits are the royalty revenues to the NSW Government from the sale of coal. That is, it illustrates that *even if* there are no other public benefits (e.g. tax payments to government, economic benefit to wage earners) aside from royalties and the costs are at the high end

of current estimates that the Project still delivers net benefits to the NSW community.[1] The quantum of the net benefits could be higher if other elements of the benefits stream are included in the analysis, although it is difficult to test/confirm the quantum of these other elements.

1 Summary of the Cost Benefit Analysis

	Gillespie Economics	Minimum threshold estimate
	$m, 2015	$m, 2015
Benefits		
Royalties	200	154 - 257
Company tax	70	
Net producer surplus	0	
Contributions not linked to demand	5	
Wage benefits to employment	25	
Non-market benefits to employment	186	
Economic benefits to landholders	Not quantified	
Economic benefits to suppliers	No material impacts	
Total benefits	**486**	**154 - 257**
Costs		
Surface water and local water supply	1	1
Agricultural impacts	0.3	
Greenhouse gas emissions	0.1	27 - 121
Forestry impacts	0.01	
Net Benefits	**485**	**32 - 229**

a The low end Net Benefit estimate assumes the lower royalty forecast with the upper greenhouse gas cost estimate.

Source: Gillespie Economics (2016), Wallarah 2 Coal Project - Economic Impact Assessment, p.46.

The analysis that we have conducted suggests that, *at a minimum*, the Project is expected to deliver net benefits in the order of $32m to $229m to the NSW community. There are expected to be additional benefits, although the quantum of these additional items is not as high as that estimated by Gillespie Economics. The quantum of benefits associated with company tax is difficult to test without additional information, however, the:

- 'wage benefits to employment' is higher than can be expected.
- inclusion of 'non-market benefits of employment' is inconsistent with the NSW Guidelines and, even if, this is incorporated into the analysis the estimate appears substantially higher than can be expected.

Our conclusion above is based on the assumption that there are a range of negative impacts that are mitigated in full or have no material impact. In particular, the Gillespie Economics analysis assumes the following:

- Subsidence, historic heritage impacts. Any impacts are assumed to compensated through payments to the mine subsidence levy.

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1 The other benefits categories are summarised on page 14 of the NSW Government's draft *Guidelines for the Economic assessment of mining and coal seam gas proposals* issued in October 2015.

- Groundwater, flooding, noise and vibration, biodiversity, visual amenity, transport/traffic, impacts. The impacts are mitigated in full with the cost of these activities included in the operating and capital costs of the mine.
- Air quality, aboriginal heritage. The impacts were assessed to have no material impact on the evaluation of the Project.

Based on our review of the EIS documentation and submissions, there appear to be a number of substantive issues raised regarding the potential environmental impacts of the proposed mine. The Central Coast Council's submission (dated 16 September 2016), for example, raised particular concerns regarding impacts on groundwater and surface water. Based on the proponent's Response to Submissions (dated November 2016) and the recent responses by the NSW Government agencies, we understand that actions will be undertaken to mitigate impacts and that any residual impacts would not materially change the results of the CBA. This suggests that Gillespie Economics treatment of the potential social and environmental impacts is reasonable.

The Australia Institute's submission (dated September 2016) also raised a separate concern regarding the financial viability of the Project. For the Project, the financial viability could change the expected company tax revenue of $70m, although even if the company tax revenue was zero the Project would still generate net benefits due to the royalty regime.

In addition to this, where a project is no longer financially viable and cannot meet its ongoing rehabilitation obligations there is the risk that these costs are borne by the taxpayer, instead of the proponent (as is assumed in the Gillespie Economics' report). The NSW Government's Mining Rehabilitation Security Deposits are designed to avoid this situation. Under the scheme companies authorised by the NSW Department of Industry to undertake mining activities must pay a security deposit prior to starting mine operations. The deposit is designed to cover the full estimated costs of rehabilitation, to the standard set by their approvals. The Department is responsible for verifying the adequacy of these rehabilitation cost estimates.

1   Introduction

In determining a development application, a consent authority must take into consideration the public interest and the likely impacts of a development. This is done through a Cost Benefit Analysis (CBA) to estimate the net present value of the project to the NSW community, and through the local effects analysis to assess the likely impacts of the development in the locality. This economic assessment forms part of the proponent's revised Environmental Impact Statement (EIS), which is required for all state significant development in accordance with Part 4 of the *Environmental Protection and Environment Act 1979* (EP&A Act). In accordance with the EP&A Act, mining activities are considered a state significant development.

About the project

The Wyong Areas Coal Joint Venture (WACJV) is seeking development consent under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the Wallarah 2 Coal Project (the Project).[2] The Project is located north-west of Wyong in the Central Coast Local Government Area in NSW.

The key features of the Project include:

- The construction and operation of an underground mining operation extracting up to 5.0 Mtpa of export quality thermal coal by longwall methods at a depth of between 350 m and 690 m below the surface within the underground Extraction Area;
- Mining and related activities will occur 24 hours a day, 7 days a week for a Project duration of 28 years;
- Tooheys Road Site (located northeast of the intersection of the M1 Motorway and the Motorway Link Road) includes a drift portal, coal handling facilities and stockpiles, water and gas management facilities, small office buildings, workshop, rail spur, train load out facility and connections to the municipal water and sewerage systems;
- The Buttonderry Site (located off Hue Hue Road, north of Sparks Road) includes administration offices, bathhouse, personnel access to the mine, ventilation shafts and water management structures;
- Western Shaft Site (located in the Wyong State Forest) includes a downcast ventilation shaft and water management structures;
- An inclined tunnel (or "drift") constructed from the coal seam beneath the Buttonderry Site to the surface at the Tooheys Road Site;

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2   Kores Australia Pty Ltd is the major shareholder and manager of the WACJV, holding 82.25% of equity. http://www.wallarah.com.au/history-of-the-wallarah-2-project

- Connections to the municipal water supply and sewerage systems;
- Capture of methane, initially for flaring (to manage greenhouse gas emissions) and later for beneficial use (such as for electricity generation at the Tooheys Road Site);
- Transport of coal by rail to the Port of Newcastle; and
- A workforce of approximately 300 full-time company employees.[3]

The Project has been in fruition over a number of years, with various iterations of the Project being submitted for development approval over the past decade. A project application was originally lodged with the Department in late 2006 under the now-repealed Part 3A of the *Environmental Planning and Assessment Act 1979*.

In July 2010, the then Minister for Planning directed the Planning Assessment Commission (PAC) to review the Project. The PAC review report was published in November 2010. The PAC concluded that "the application may be approved subject to the imposition of a substantial number of conditions covering the full range of issues". In March 2011, the former Minister for Planning refused the application because of uncertainties in relation to the subsidence predictions, ability to meet acceptable water quality outcomes, and ecological and heritage impacts.[4]

A revised development application was submitted to the former Department of Planning and Infrastructure in October 2012. Although there were similarities between the revised project and the project reviewed by the PAC in 2010, there were also significant differences. The differences were intended to address the issues previously raised by the PAC. The main difference in the design on the mine site was that the current application excludes the eleven western longwalls that were in steeper terrain under Jilliby State Conservation Area. A range of additional studies and information was prepared including:

- revised subsidence model/predictions with peer review;
- additional geology report with peer review;
- revised groundwater and surface water impact assessments;
- additional boreholes and testing;
- development of performance measures;
- adaptive management approach in Extraction Plan process;
- additional ecological surveys; and
- additional heritage surveys.[5]

The PAC published its Review Report (PAC Report) in June 2014 raising a range of potential concerns about the project and recommending actions to mitigate impacts. The review noted that

> If the recommendations concerning improved strategies to avoid, mitigate or manage the predicted impacts of the project are adopted, there is merit in allowing the project to proceed.

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3   Gillespie Economics (2016), p. 10.

4   PAC (2014), Wallarah 2 Coal Project Review Report, June, p.7.

5   PAC (2014), Wallarah 2 Coal Project Review Report, June, p.10.

Following the review by the PAC, the Project was the subject of legal proceedings in the NSW Land and Environment Court initiated by the Darkinjung Local Aboriginal Land. In light of the Court's judgment, and in the absence of a negotiated outcome with the Land Council, coal transportation infrastructure and sewer connection for the Project was re-designed to avoid land owned by the Council.

The amended application was placed on public exhibition from 22 July 2016 to 5 September 2016. Government agencies and other stakeholders have provided comment on the amended application. On 23 September 2016, NSW DPE requested that WACJV respond to concerns raised.[6] On 4 November 2016 the proponent has also prepared a separate document responding to concerns in the submissions.[7]

Scope of review

The CIE has been engaged by NSW DPE to peer review the economic assessment and produced by Gillespie Economics, presented in Appendix J of the EIS documentation prepared by Hansen Bailey for the WACJV. The scope of the review includes:

- the assumptions relied on are reasonable and appropriate;
- the cost benefit analysis aligns with current best practice;
- the assessment is consistent with any relevant Government guidelines; and
- the assessment contains any deficiencies (eg inconsistencies, contradictions or information gaps). If so, the report should make recommendations on how to resolve these in the assessment of the project.

The scope of the review also includes consideration of the criticisms raised by The Australia Institute's submission (dated September 2016), on the amended development application.

6
    https://majorprojects.affinitylive.com/public/f04b1037c8832e53b02af2fdd379a75b/01.%20Wallarah%202%20Coal%20Project_Amendment%20to%20DA_DPE%20Letter_Request%20RTS.pdf

7
    https://majorprojects.affinitylive.com/public/ec3f9c10395ce29b16f1e1f558a79471/Wallarah%202%20Coal%20Project_Amended%20DA%20RTS%20Part%201.pdf

2   Features of a CBA

A CBA framework is a widely used tool for deciding *ex-ante* between alternative options (policies or projects). It allows decision makers to consider trade-offs arising from different options in order to assist decisions of whether the community as a whole is better off or worse off by adopting an option.

A CBA framework is focused on the aggregate welfare of the community, rather than the welfare of individual groups. It should take account of the full range of potential benefits and costs of the options, including environmental, health and other social impacts as well as the economic impacts. Where benefits exceed costs, the options are deemed to deliver a net benefit to the community as a whole. Where costs exceed the benefits, then the options should be rejected as society is worse-off if the options were implemented. Where there are a number of options, all of which deliver net benefits (i.e. benefits exceed costs), then the option that generates the highest net benefit is preferred.

Impacts are often not known with certainty.[8] In these circumstances the CBA needs to be presented as an expected value taking account of the range of possible outcomes (each with a known probability of occurrence). In some circumstances, not all impacts can be readily quantified and valued in a robust manner. Decision makers will need to draw on other information to complement the result of the CBA and to assist in deciding on whether society is better off from adopting an option.

In conducting this peer review, we have relied on the Government's *NSW Guidelines for the economic assessment of mining and coal seam gas proposals* (December 2015). Technical notes will support the guidelines and outline methodologies, parameters and assumptions for the economic assessment. Technical notes are currently unavailable, therefore, the methods applied in this peer review have relied on the methodologies and assumptions in the draft Guidelines (October 2015). We have also referred to the 2012 NSW Government (2012), *Guidelines for the use of Cost Benefit Analysis in mining and coal seam gas proposals,* where relevant.

The NSW Guidelines specifies the key features of a CBA in mining and coal seam gas proposals, as summarised in Box 2.1.

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8   For the purposes of our analysis we use the term risk and uncertainty interchangeably. In theory, risk refers to events where a probability distribution can be developed whereas uncertainty refers to situations where the probability of outcomes cannot be estimated.

2.1 Key features of a CBA[9]

- Scope – A CBA should include all first round (primary) impacts both direct and indirect but not secondary impacts.

- Discount rate - A discount rate of 7 percent per annum with sensitivity testing at 4 per cent and 10 per cent per annum.

- Timeframe - A term that reflects the time horizon of the impacts of a proposal. Long-term mining projects should use a 30-year timeframe from when the mine became operational and where applicable a residual value beyond that timeframe.

- Risk and Uncertainty - A 'risk neutral' approach to expected costs and benefits.

- Unquantified factors – Decisions based on the quantified expected net benefits in conjunction with information on any impacts that cannot be valued.

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9 NSW Government (2015) *Guidelines for the use of Cost Benefit Analysis in mining and coal seam gas proposals,* December, page 4.

3   Review of CBA

This chapter reviews key elements of the CBA conducted by Gillespie Economics.

Scope of the CBA

The NSW Government Guidelines provide the following guidance for defining the scope of the CBA:[10]

> These benefits and costs should be estimated where possible as those that accrue to New South Wales. In the first instance, it will generally be most practical to assess all major costs and benefits to whoever they accrue and then adjust to estimate the proportion of these attributable to residents of the State.

There are two types of analysis presented by Gilliespie Economics.

- The main body of the CBA presents the first round effects of the Project from the perspective of NSW residents in most cases by virtue of the fact that the majority of external costs only affect residents near the mine and presents the direct impact only. The majority of the net producer surplus does not go to the NSW as the majority of ownership of the mining companies is foreign.
- The regional impact Analysis attempts to incorporate second round, or indirect effects, of the Project along with the CBA findings to disaggregate costs and benefits at the LGA level, the State level and the "rest of world" level.

The scope defined in the Gillespie report is reasonable and is consistent with the NSW Government Guidelines, although there are some issues raised in regards to the estimation of the quantum of benefits (noted later in this report).

Project definition

The Project has been defined as the construction and ongoing operation of a new coal mine, producing thermal coal for the export market. The Project also includes ancillary activities such as the coal handling facilities and stockpiles, water and gas management facilities, small office buildings, workshop, rail spur, train load out facility and connections to the municipal water and sewerage systems.

The Project has been defined at a detailed level to enable a robust assessment to be undertaken.

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[10] NSW Government (2012), *Guidelines for the use of Cost Benefit Analysis in mining and coal seam gas proposals*, November, page 5.

Alternative options

The EIS presents the findings in relation to a single option. The economic assessment is conducted for this option and the base case (or status quo). Having said this, there have been several amendments to the Project over the past few years in order to address issues raised in the previous reviews of the earlier submissions.

Notwithstanding this, the economic analysis does not specifically put forward a range of alternatives to be evaluated in the modelling. Given this, the analysis does not present a ranking of alternative projects.

Timeframe and discount rate

The analysis presents the impacts in a discounted cashflow framework over the timeframe for the Project (production commencing from 2020 to 2045). A 7 per cent real discount rate is adopted for the main part of the analysis and alternative sensitivity testing using discount rates of 4 per cent and 10 per cent were conducted, consistent with the NSW Treasury Guidelines.

Estimated Benefits

Gillespie Economics estimates the benefits of the Project at $486m. The key components of the benefits are royalties ($200m), non-market benefits of employment ($186m), company tax ($70m) and wage benefits to employees ($25m).

Royalties

The royalties received by the NSW Government in the future depends on the future production from the mine as well as the price received for the coal. A proportion of this future value is received by the state as a royalty payment. The royalty rate applied depends on whether the coal is extracted from underground or an open cut mine. Deductions may also apply.

The future production profile from the mine is largely determined by a range of physical factors (e.g. the location of the coal) as well as other factors such as the demand for the coal and the expectations of future commodity prices. The expected production profile from the mine is presented in chart 3.1. On average, the mine expects to extract 4 million tonnes per annum. Gillespie Economics assumes that 100 per cent of the ROM coal will be 'converted' into saleable coal.[11]

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11 Gillespie Economics, email dated 21 December 2016.

3.1 Production profile
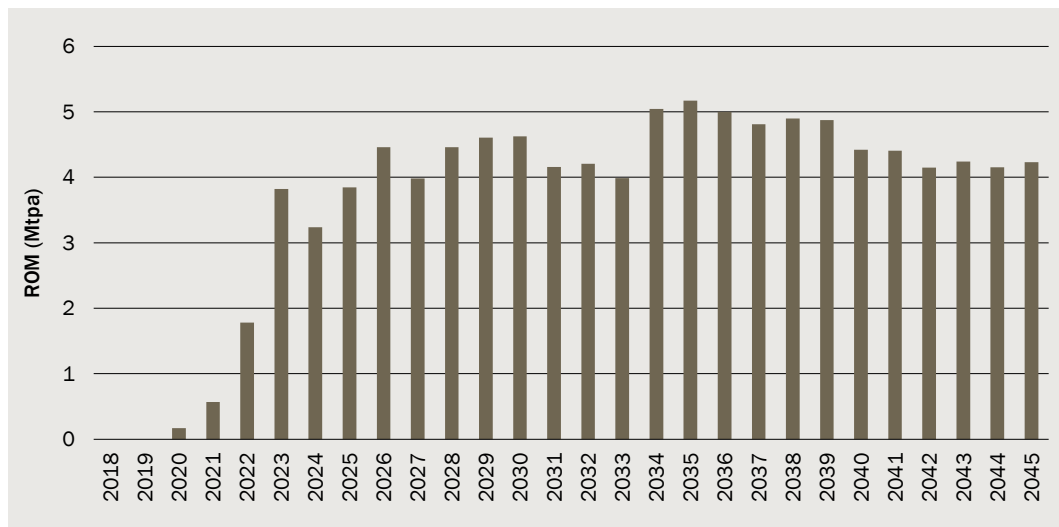
Data source: Email from Gillespie Economics, 21 December 2016

A key factor influencing the expected royalties received is the future price of coal. Gillespie Economics source the coal price estimates from Wood McKenzie[12]. Different price assumptions are used for coal with calorific content 6,000 kcal/kg in years 1-4 of production and 5,500 kcal/kg for subsequent years. The dollar value of the benchmark price forecasts are confidential, however, an estimated average price of AUD$99 per tonne is used by Gillespie for the life of the project with an assumed US/AUD exchange rate of 0.72.[13]

Thermal coal price volatility must be considered when applying forecasts to revenue estimations. Coal exports globally have increased nearly threefold in the past 20 years, at a compounded rate of 5 per cent, outstripping consumption growth of 2 per cent in the same period.[14] Supply increases have dominated the previous 7 years, however, there was a slowing of demand growth, resulting in 150 million tonnes of oversupplied coal.[15]

Over the past year thermal coal prices have fluctuated in response to downward and upward price pressures caused respectively by

- slowing import demand in major importing countries such as Japan, China and India;
- mandated cuts to supply in China coupled with a spike in their electricity consumption and weather related production disruptions and mine closures in Indonesia (the world's largest thermal coal exporter).[16]

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[12] Gillespie Economics (2016), *Wallarah 2 Coal Project Economic Impact Assessment,* p.33

[13] While the average price is presented Gillespie Economics state that "much lower prices are used in the early years of the Project with coal prices increasing over time in line with Wood Mackenzie forecasts".

[14] Accenture (2013), *From Thermal Coal Production to Marketing and Trading*, p.4

[15] Ibid. Accenture (2013), p.3

[16] Australian Department of Industry (2016), *Resources and Energy Quarterly, September 2016*, p.45.

The Department of Industry's March 2016 quarterly report forecasted a continual fall in price, culminating in an estimated benchmark price of US$59 a tonne for the Japanese financial year (JFY) March 2016 to April 2017.[17] The actual price settled by Glencore and Japanese utility Tohoku Electric Power was marginally higher than expectations at US$61.60 a tonne.[18]

Thermal coal prices rose further than anticipated in the September 2016 quarter reaching a two-year high of US$70 a tonne[19]. This comes off the back of a declining coal price trend starting in early 2011 as shown in chart 3.2. The JFY 2017 price is forecast to rise to US$64 a tonne.[20] Based on the AUS/USD exchange rate of 0.72, forecast prices in 2017 would be around A$88.89 per tonne.

3.2   Thermal Coal Spot Prices
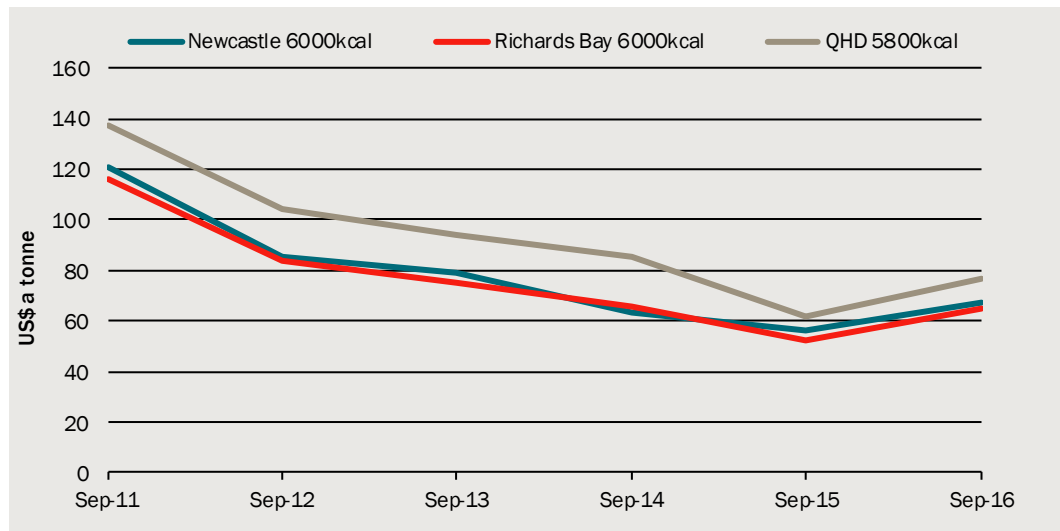
Data source: Australian Department of Industry, (2015) *Resources and Energy Quarterly*, September 2016, p.45.

In the 2015 assessment of the Mount Owen mine extension the NSW Department of Trade and Investment estimated short and medium to long-term thermal coal prices of $A97 to $117 per tonne respectively.[21]

The Australia Institute's submission (dated September 2016) notes that in 2014 the Australian Treasury forecast long term thermal coal prices to be around AUD $80 per tonne.

Coal prices are subject to further variation caused by movements in the AUD/USD exchange rate. This past year the Australian dollar traded at a low of 0.69 US cents on 20 January 2016 and a peak of 0.78 US cents on 21 April 2016, as shown in figure3.3.

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17 Australian Department of Industry (2015), *Resources and Energy Quarterly, March 2016*, p.58.

18 Australian Department of Industry (2015), *Resources and Energy Quarterly, June 2016*, p.44.

19 Ibid. Australian Department of Industry (2016), p.45

20 Ibid. Australian Department of Industry, (2016) p.45.

21 NSW Department of Trade and Investment 2015, *Mount Owen continued operations project (SSD 5850) Review of Environmental Impact Assessment*, OUT 15/4442, Sydney. Letter dated 9 March 2015.

Movements in the exchange rate are incredibly difficult to predict due to the multitude of influencing internal and external factors.

Ali and Rahman (2012) discuss this issue in a paper analysing the influence of coal exports on the AUD/USD exchange rate.

> The main internal factors are: balance of trade (export vs. import), employment opportunity in Australia, interest rate, retail sales, commodity price, inflation rate, government deficits, ownership of large companies, ownership of real estate etc. The relevant external factors are: relative job opportunities, interest rates, inflation rate, government policies, volume of export and import etc. in the trading partner countries.[22]

3.3 AUD/USD Exchange rate
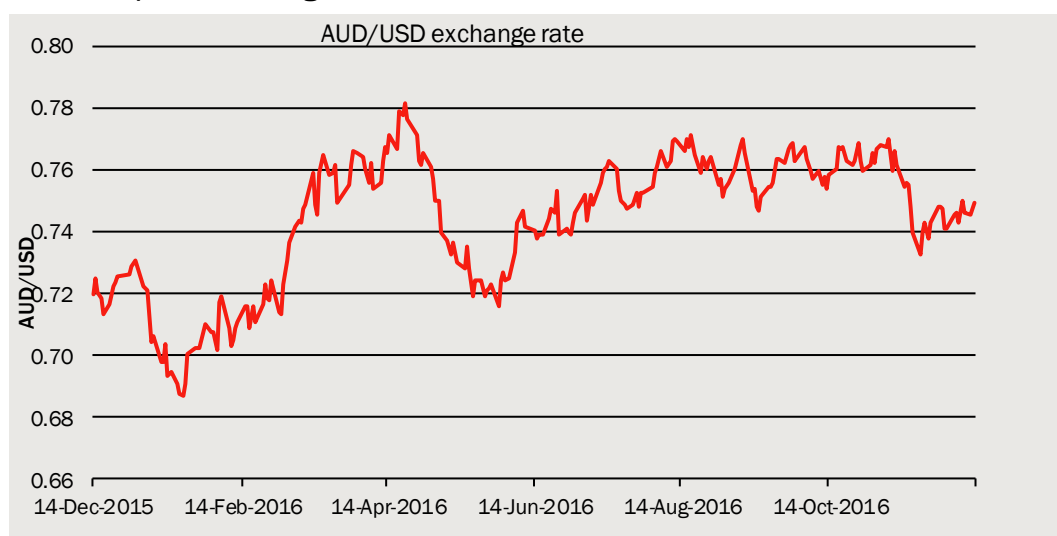
Data source: Reserve Bank of Australia, Exchange Rate Historical Data (2016).

■ **The estimated price of A$99 a tonne used by Gillespie economics in the CBA is in line with the forecasts from a range of sources. However, given the uncertainty regarding future prices, for the estimation of royalties from the Project it is reasonable to use a lower bound and upper bound price estimates of between AUD$80-$117 per tonne.**

Based on the Proponent's production and price assumptions, Gillespie Economics estimates the total royalty payment to be $200m in present value terms. Using a coal price of between A$80-A$117 per tonne and assuming maximum deductions $0.50 per tonne implies a royalty range of $156m to $259m in present value terms over the life of the Project.

Non-market benefits of employment

The rationale for inclusion of this item is that,

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22 Ali, M. L., and Rahman, S. F. (2012). *Influence Of Australian Coal Export On A$/US$ Exchange Rate: A Longitudinal Study*. International Business & Economics Research Journal, 11(4), 397 - 406.

….there may also be spillover effects and externalities to third parties. These are public good values. Spill-over effects referred to in the literature relate to empathy based losses to family or friends (close associates) of impacted workers because of the workers being unemployed and increased crime and community dislocation (Haveman and Weimer 2015: Streeting and Hamilton 1991). Empathy based impacts may also spill over more broadly into the existence values of others in the community who feel sympathy for the unemployed.[23]

Gillespie Economics estimated the non-market value of employment at the Project to be $186 million (in present value terms).[24] This is based on an average non-market value of approximately $25 000 per employee per year transferred from a choice modelling study conducted by Gillespie Economics in 2009.[25]

The reported values reflect empathy values "because of the workers being unemployed and increased crime and community dislocation". However, as the BDA Group points out, the context of a fully employed economy may not be as pertinent.[26] The Gillespie Economics analysis does not appear that consideration has been given to the existing employment status of the employees, nor the impacts of potential 'crowding out' of existing jobs.

To put this non-market value into perspective, if the value of $25 000 per mining employee per year was applied to all workers in the mining industry (approximately 40 000 in NSW) [27], the total non-market benefit of employment in the mining industry would be approximately $1 billion per year. It seems unrealistic that NSW residents are willing to pay $1 billion per year (equivalent to $350 per household per year) to attain the non-market benefit of mining employment. As a comparison, if 20 per cent of mining employees would otherwise have been unemployed, the avoided cost of unemployment benefits, paid indirectly by households through tax revenue, would be equal to approximately $40 per household per year, significantly lower than $350 per household per year.

Gillespie Economics recognise that the inclusion of this benefit category is contentious and have, therefore, reported the results 'with and without' the inclusion of these benefits. The inclusion of this category of benefits is also inconsistent with NSW Government (December 2015) Guidelines.

■ **Given the highly contentious nature of these estimates, the CIE recommends the estimated non-market value of employment is excluded from the economic analysis of the Project.**

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[23] Gillespie Economics (2016), p.40.

[24] Based on 300 employees over 25 years

[25] Gillespie Economics, 2009, *Bulli Seam Operations: Choice Modelling Study of Environmental and Social Impacts*, Prepared for Illawarra Coal Holdings Pty Ltd.

[26] BDA Group (2016), *Economics Peer Review*, p.4.

[27] NSW Mining, *Fast Facts*, http://www.nswmining.com.au/industry/fast-facts

Company tax

The other key benefits are associated with the distribution of company taxes (paid to the Australian Government) allocated to NSW level, estimated at $70 million in present value terms.

Company tax from the Project was estimated based on a discounted cash flow analysis of the Project adjusted for depreciation, and the application of a 30 per cent tax rate to estimated taxable income.[28] 32 per cent of the estimated company tax generated from the Project is attributed to NSW.[29]

The Australia Institute (September 2016), on the other hand, argues that the mine is not expected to be financially viable. It quotes the operating costs of mines in Australia and abroad, arguing that the stated operating costs of the Project are not credible. It also notes that

> Given the complexities involved in company tax payments, particularly with large companies with offshore entities, this is inappropriate and almost certainly serves to overestimate the benefits of the project. Mining companies have a huge array of ways to minimise company tax payments and this calculation should be shown in detail.[30]

■ **Given the complexities of potential tax arrangements and the need for detailed (potentially confidential) information we have not sought to test the estimates presented in Gillespie Economics analysis. The estimates could, therefore, be seen as an upper bound estimate of the benefits associated with company tax payments.**

Wage benefits to employees

Workers in the mining project who would otherwise be unemployed, working part-time or working in other non-mining sectors may gain higher wages than they would without the project. This is a labour/wage premium and represents a gain to these workers. The cost benefit framework outlined in the NSW Government guidelines recognises this as a potential gain to be included in a CBA.

Gillespie Economics include this gain and state that,

> Following the approach of Streeting and Hamilton (1991) if it were assumed that 50% of the direct workforce of the Project (150 out of a total of 300 jobs) would otherwise be unemployed for three years and that the reservation wage for these people was $52,000 compared to a mining wage of $134,000, then the market employment benefit in terms of income would be $25M present value, at a 7% discount rate.[31]

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28 Gillespie Economics (2016), p.42.

29 Gillespie Economics (2016), p.45.

30 The Australia Institute (2016), p.11.

31 Gillespie Economics (2016), p.40.

In theory, the economic benefit to workers is the difference between the wage that he or she is paid in the mining project and the minimum (*reservation*)[32] wage at which they would be 'indifferent' to working in the mining sector (chart 3.4).[33] The minimum wage reflects the employment opportunity costs, skill level required and the relative disutility of an employment position. However, in practice, minimum (reservation) wages are not observable.

3.4   Identifying the economic benefit to workers
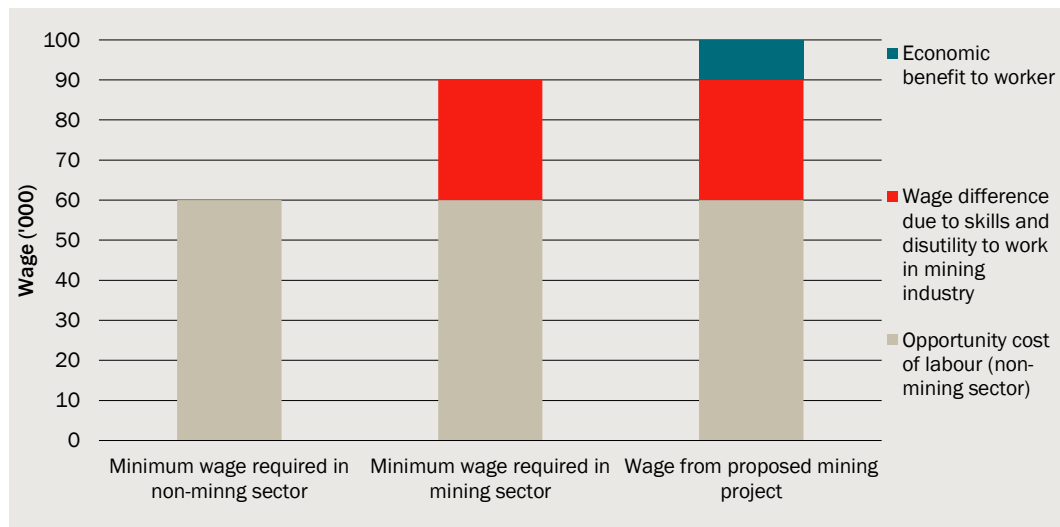
Data source: The CIE.

Further, in theory, a CBA for NSW should include the economic benefit to workers already residing in NSW prior to the project (the base case). The economic benefit to workers migrating to NSW should not be included in the CBA for NSW. The estimate should be based on the proportion of NSW resident and non-NSW resident workers to be employed by the project for the purposes of attribution.

In practice, measuring the wage premium is challenging. In a 2016 study for the Department the CIE sought to estimate the benefits to mining workers based on available data. The CIE found that:

- an increase in mining employment increases the mining wage, showing that there are worker benefits.
- the impact of mining employment on the mining wage differs across remoteness areas.
- the positive effect of a change in mining employment on mining income declines as the initial share of mining employment increases.

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32 The reservation wage is the minimum wage a worker has to be paid to work in a particular industry. In view of the hours of work and working conditions, there is a reasonable possibility that workers' reservation wages in mining are higher than in other industries. and take into account hours of work and working conditions.

33 NSW Government (2015), draft *Guidelines for the economic assessment of mining and coal seam gas proposals*, October, p. 20.

- the positive effect of a change in mining employment on mining income declines as the initial unemployment rate increases.[34]

The paper estimated the benefits to mining workers in terms of a proportional change in the mining wage in response to a 100 per cent change in mining employment (table 3.5). For example, a 100 per cent increase in mining employment in Inner Regional Australia will increase the mining wage by 10.7 per cent.

3.5   Mining income/Mining employment elasticity by remoteness area

Remoteness area	Elasticity
	per cent
Major cities of Australia[a]	0
Inner regional Australia	10.7
Outer regional Australia	5.8
Remote Australia	4.3
Very remote Australia[a]	0

[a] The estimated elasticities for Major Cities of Australia and Very Remote Australia were -1.7 and -6.7 respectively. However, we have assumed the elasticity to be 0 in these two remoteness areas due to limited constraints on labour supply for new mines due to minimal mining activity in Major Cities of Australia and the fly-in fly-out labour market servicing Very Remote Australia.

Note: The wage premium due to changes in mining employment may be underestimated as the modelling is based on ABS income data which specifies the highest income bracket of "$2500 plus". Conversely the estimate is slightly biased upwards because the ABS income estimate includes all income sources, not just income from direct employment.

Source: The CIE based on ABS data.

Using this information the benefits associated with the wage premium can be approximated as follows:

- The mine is located near Wyong which we consider to be in Inner Regional Australia. The mining income/mining employment elasticity estimated for Inner Regional Australia is 10.7 per cent for a 100 per cent increase in mining employment.

- Based on the Gillespie Economics report (p.55) there were 1,972 employed in the mining sector in the local area which is defined as the Gosford, Wyong and Lake Macquarie LGAs. If the Project will employ on average 300 additional persons over the life of the Project which is equivalent to a 15 per cent increase in mining employment in the local area.[35]

- Assuming a pre-tax mining wage of $130,000 per annum, the 15 per cent increase in mining employment as a result of the Project would increase the average mining wage to around $132,116 per annum assuming a 10.7 per cent income/employment elasticity. That is, the wage premium per worker for the Project is $2,116.

- The total economic benefit to workers of the Project is equivalent to the wage premium per worker ($2,116) multiplied by the number of NSW based workers

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[34] CIE (2016), *Economic benefits of mining projects for NSW: Estimating default values for indirect economic benefits*, January.

[35] If the local area was expanded to include Singleton, Cessnock and Newcastle the incremental proportional effect of the Project on mining employment would be substantially less. However, for the purposes of this illustration we have adopted Gillespie Economics assumption of 1,971 persons employed in the mining sector.

employed in the Project. Assuming that all workers employed in the Project are NSW based, the economic benefit to mining workers is around $635,000 per annum (even without adjustment to capture disutility of marginal workers entering the mining industry. Over the life of the Project this is equivalent to around $7.4m in present value terms. However, once adjusting for the disutility of marginal workers entering the mining industry the benefit is closer $3.7m in present value terms.

The approach described above provides an approximation of the potential impacts on the mining wage. In order to refine this analysis further additional detailed information is required on, for example, the current unemployment rates in the area and evidence that the new mine would draw labour from the currently unemployed.

■ **The analysis above provides an indication of the 'orders of magnitude' that can be expected associated with the benefits attributable to the wage premium. For the purposes of the CBA, and in the absence of more detailed data on the labour force in the area, it reasonable to assume that the benefit attributable to the wage premium is between $3.7m to $7.4m in present value terms.**

Estimated costs

The Gillespie Economics report assumes that there are a range of negative impacts that are mitigated in full or have no material impact. In particular, the Gillespie Economics analysis assumes the following:

■ Subsidence, historic heritage impacts. Any impacts are assumed to be compensated through payments to the mine subsidence levy. Gillespie has not specified the exact cost of contribution to the mine subsidence levy, only stating it is between $0.00132 to $0.39006.[36]

■ Groundwater, flooding, noise and vibration, biodiversity, visual amenity, transport/traffic, impacts. The impacts are mitigated in full with the cost of these activities included in the operating and capital costs of the mine.

■ Air quality, aboriginal heritage. The impacts were assessed to have no material impact on the evaluation of the Project.

The analysis, therefore, focuses on the quantification of a number of unmitigated impacts relating to:

■ Surface water and local water supply

■ Greenhouse gas emissions

■ Agricultural impacts

■ Forestry impacts

For the purpose of our review, we have focused on the surface water and greenhouse gas emissions as these are expected to result in the largest cost item.

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36   Gillespie Economics (2016), *Wallarah 2 Coal Project Economic Impact Assessment,* p.101

Water

Underground mining presents various risks to the groundwater system. However, through monitoring and management these impacts can be mitigated and minimised.

The Project is predicted to have impacts on both shallow and deep groundwater systems, however, these impacts are expected to be minimal and will be managed by the WACJV Groundwater Monitoring Plan. The Groundwater Impact Assessment (GIA) predicts minor seepage at the alluvial aquifers of the Yarramalong and Dooralong valleys and the shallow hardrock areas of 2 mililitres/m^2/day and 4 mililitres/m^2/day respectively. By comparison, average rainfall is expected to be 130 millilitres/m2/day and as a result will replenish water losses from seepage.[37]

The WACJV will obtain water access licences (WALs) for 300ML to mitigate the effects of subsidence on the alluvial groundwater system and reduce runoff contributions while affected areas equilibrate to near normal conditions. Gillespie assumes a market value of $2,000/ML for the WALs, resulting in a total cost for the 300 WALs to be $0.6M.[38] Based on our review of historical prices presented by the National Water Commission and some recent observed groundwater trades, the price assumption used by Gillespie is reasonable.[39]

Notwithstanding this, the WACJV currently holds an entitlement of 185 units/ML in the Jilliby Creek Water Source and is requested by DPI water report any updates on the water licensing strategy.[40]

The WACJV will be required to acquire appropriate licences for the extraction of groundwater under part 5 of the Water Act 1912. However, this is expected to be negligible, as the majority of groundwater will be sourced from the coal seam or the deep overburden strata within the fractured zone.[41] Gillespie reports that within the Jilliby Jilliby Water Source and the Wyong Water Source, exist sufficient transferrable licences to purchase.[42] Excess treated water produced by the project will be provided to the Central Coast Water Authority to offset potential impacts on catchment yield.[43]

The water treatment plant will produce brine as a by-product of the reverse osmosis process, which will be dewatered and stored in an underground sump. The WACJV in conjunction with EPA and DPI water will prepare a Brine Treatment Management Plan prior to construction of the surface facilities. The underground mine will act as a groundwater sink for approximately 500 years and as a result will inhibit the movement

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[37] Gillespie Economics (2016), *Wallarah 2 Coal Project Economic Impact Assessment,* p.12

[38] Ibid, Gillespie, p.36

[39] National Water Commission (2014), Australian water markets: trends and drivers 2007–08 to 2012–13, p.32.

[40] Department of Primary Industries (2016), *Comment on the Environmental Impact Statement, attachment A*

[41] Ibid, Gillespie, p.12

[42] Ibid, Gillespie, p.12

[43] Ibid, Gillespie, p.15

of the highly salty brine.[44] Consequently, the brine is not expected to have a measureable impact on water quality.

Twelve bores have been identified within the project footprint that may be affected by either loss of pressure head or loss of structural integrity. According to the EIS documents these bores can be repaired or re-drilled without loss of yield.[45]

Based on the proponent's Response to Submissions (dated November 2016) and the recent responses by the NSW Government agencies, we understand that actions will be undertaken to mitigate impacts and that any residual impacts would not materially change the results of the CBA.

- **The impact of the project on water supply and quality has been adequately mitigated through the collaborated creation of monitoring and management plans.**

Greenhouse gas

In its review of air pollution, Pacific Environment estimates that the project will generate 5.7 million tonnes (Mt) of scope 1 and 2 and 0.3 Mt of scope 3 emissions from mining and transport of product coal by rail to the port.

3.6   Predicted Greenhouse Gas Emissions

Class of Emissions	Greenhouse gas emissions
	t CO2e
Scope 1	4,643,044
Scope 2	1,061,990
Scope 3	256,026,932

a For the purpose of the CBA, Gillespie Economics (p.39) assumes that only 0.3 Mt of scope 3 emissions associated with rail transport of coal to port are included

Source: Pacific Environment Limited (2016), Air Quality and Greenhouse Gas Assessment - Addendum, p.49

In order to calculate the cost of the emissions, Gillespie uses three shadow prices, the Forecast European Union Emission Allowance Units price, the Australian Treasury Clean Energy Future Policy Scenario and the US EPA Social Cost of Carbon.

The NSW Energy Saving Scheme[46] suggests using the Forecast European Union Emission Allowance Units price forecasts while using the other prices to test sensitivity. Using these prices, the present value of emissions for the project is between $27m and $121m.

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44 Ibid, Gillespie, p.14

45 Mackie Environmental Research (2013), *Groundwater Impact Assessment*, p.4

46 NSW (2015), Review of the NSW Energy Savings Scheme: Part 2: Options Paper, Page 128.

3.7 Alternative estimates of the economic cost of greenhouse gas emissions

Carbon Price	Total Cost	Australian percentage of World population	NSW percentage of Australian population
	$'m, present value	$'m, present value	$'m, present value
European Unit Price	26.6	0.08	0.03
EPA Social Cost of Carbon	47.0	0.14	0.05
Australian Treasury	120.8	0.36	0.12

Note: There are some minor differences between the costs presented in Gillespie Economics p.39 and that calculated by the CIE using available data.

Source: Gillespie Economics, verified by The CIE.

Gillespie makes the argument that the cost of emissions should be scaled downwards as Australia comprises 0.3% of the world population and NSW 32% of that. This results in a cost estimate of between $25,000 and $114,000 (in present value terms).

This approach is inconsistent with the 2015 draft guidelines, which require the attribution of the full cost (i.e. between $27m and $121m). Having said this, we recognise that there is debate in the economic literature regarding the extent to which the global social cost of carbon is appropriate for the use in the benefit cost analysis of domestic policy options.[47] Nevertheless, irrespective of whether the costs associated with greenhouse gas emissions (under all price scenarios) are allocated in full to NSW or only a portion is allocated to NSW this does not change the conclusions.

- **The economic cost of greenhouse emissions ranges from between $27m and $121m, assuming 100 per cent of the impacts from greenhouse gas emissions are allocated to NSW.**

Other impacts

There are a range of other potential impacts arising from the Project.

Air Quality

Impacts on air quality are relatively low as the project is an underground mine. Dust emissions are primarily the result of the following operations; coal stockpiling, coal transfers by conveyor, coal loading and rail movements.

Emissions from construction are projected to be 84%, 48% and 22% of the emissions estimated to occur during the operational phase of the project for TSP, PM_{10} and $PM_{2.5}$ respectively.[48] As a result, compliance during the operational phase will extend throughout the Project.

The assessment of incremental PM_{10}, $PM_{2.5}$, TSP and dust deposition at the closest residential receptors found all levels to be below impact assessment criteria[49]. The

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[47] See for example Kotchen, M (2016), *Which Social Cost of Carbon? A theoretical Perspective*, National Bureau of Economic Research, May, Working Paper 22246, http://www.nber.org/papers/w22246

[48] Pacific Environment Limited (2016), *Air Quality and Greenhouse Gas Assessment - Addendum*, p.v

[49] Ibid, Pacific Environment Limited, p.v

WACJV will implement emission reduction strategies in line with best practice controls based off the recommendations of the *NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining*[50], a study commissioned by the EPA. Furthermore, the existing high volume air samplers will be augmented or replaced by a continuous monitoring instrument at a location representative of receivers susceptible to short term dust elevations.

Emissions to air associated with the flaring of methane have been assessed and shown to have minor cumulative affects when added to existing background levels.

The Air Quality Greenhouse Gas Assessment has identified one privately owned receiver in the vicinity of the Buttonderry site who could experience ground level concentrations (glcs) of above the assessment criteria of 2 odour units (OU). According to the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*[51], the acceptable levels of OU range from 2 to 7, for dense urban populations to single rural residences respectively. Accordingly, the 3 OU prediction for the private residence would be acceptable as they reside in a non-urban environment.

■ **Gillespie has outlined all potential impacts on air quality and found there to be no impact above assessment criteria. There is one incident of glcs above the assessment criteria however it is within the acceptable limits for a rural residence. NSW Government agencies that regulate air quality impacts have not raised major concerns regarding potential unmitigated impacts arising from air pollution.**

Impact on other landholders

A key part of controversy around the Wallarah 2 project has been its potential impacts on land owned by the Darkinjung Local Aboriginal Land Council (DLALC) and the various developments existing and planned for this area. The Australia Institute argues that the economic assessment includes no consideration of costs that might be imposed on the Darkinjung in either the CBA or the local effects analysis.

In the Department's letter (dated 23 September 2016) to WACJV seeking its response to submissions,

> The Department acknowledges the Darkinjung LALC as a significant landholder of land surrounding the proposed amendment area. The Department considers that the interests of the Darkinjung LALC in regards to its land surrounding the amendment proposal have not been adequately considered in the EIS. Further detailed information regarding proximity of these land parcels to the proposed coal infrastructure, and potential noise, air quality and visual impacts should be provided. As discussed in Section 4, photomontages of the proposed coal infrastructure as potentially viewed from these parcels of land should be provided.

In its Response to Submissions, WACJV argues that there is no clear evidence that the land owned by the DLALC has been identified as land proposed for residential

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[50] Donnelly, S et al (2011), Prepared by Katestone Enivironmental Pty Ltd for Office of Environment and Heritage June 2011. "*NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining*"

[51] NSW Department of Environment and Conservation (2005), "*Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales*"

development. This conclusion is based on the proponents interpretation of the following documents: the Wyong Shire Settlement Strategy 2013, the North Wyong Shire Structure Plan 2012 and the Central Coast Regional Plan 2036.

- **We are unaware of any evidence to suggest that the land will be developed for residential properties in the short to medium term. On this basis, the approach adopted in the economic analysis is reasonable.**

Transmission Lines

The project underlies two 330kV transmission lines and 29 associated towers owned by Transgrid. Mining induced horizontal loads can impact the towers bay length. The WACJV in conjunction with Transgrid are developing a mitigation strategy whereby protective measures are being fitted to the towers.

Two tension towers (21-44-T and 22-52-T) have large deviation angles and as a result cannot be safeguarded by the previous mitigation strategy.[52] In a last choice scenario the coal surrounding the towers can be sterilised, thereby safeguarding the area, although reducing the coal yield.

A mine subsidence management committee has been recommended by the MSEC, to be formed between the WACJV, Transgrid and the MSB. The purpose of the committee is to oversee the development of a contingency plan in the event the affected towers cannot be resolved with altered development patterns.

The towers will not be undermined in the first 20 years of the project, which provides the committee time to test alternative safeguarding strategies for the towers as well as conduct ground movement monitoring.[53]

The economic cost of this contingency has not been quantified by Gillespie. The WACJV has agreed to bear the costs of any mitigation and management measures to reduce the impact of subsidence on the towers.[54] The impact of coal sterilisation can be quantified by using the Gillespie sensitivity analysis. A 30 per cent reduction in the volume of coal (from year 2040 onward), reduces the royalty revenue from $154m to $151m (based on the lowest price forecast). The cost of works in the process agreement would be negligible in respect of the projects entirety.

- **While the estimated cost of mitigating the Transgrid towers in unknown, a 30% decrease in the volume of coal after the first 20 years of the Project reduces the expected royalty revenue to $151m (based on the lowest price forecast).**

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[52] Mine Subsidence Engineering Consultants (2013), *"Subsidence Predictions and Impact Assessments"* p.98

[53] Ibid, MSEC, p.100

[54] Ibid, EIS, p.11

Financial viability and rehabilitation costs

In its submission, The Australia Institute has raised concerns regarding the financial viability of the Project. It notes that

> …..many coal projects are being delayed or abandoned in NSW and beyond. Many coal companies are in financial distress, with several filing for bankruptcy protection in the USA, including former major company Peabody Energy. Existing coal mines are being traded at peppercorn prices in Australia and shares in operating mines can be bought cheaply. It is highly unlikely in this environment that a company would invest in a new, deep-underground greenfields thermal coal mine, particularly one with so much political and environmental controversy surrounding it. (p.6)

The financial viability can impact on the profitability of the mine, impacting on the expected revenue from company taxes. The financial viability of a project could also has implications for who bears the rehabilitation costs of the project.

The site remediation costs of the mine are assumed to be met by the proponent. Where a proponent is in financial stress there is a bond held that is intended to cover the full remediation liability. To the extent that the bond does not cover the full remediation costs, or where these obligations can be avoided, these liabilities are likely to fall on the public. If this occurred it could significantly reduce the net benefits derived from the project.

The security amount is determined and held by DRE to provide and maintain security funding for the DRE to fulfil obligations in the event that the title is cancelled or the titleholder fails to comply with rehabilitation requirements. The deposit is calculated in accordance with the Rehabilitation Security Deposits Policy[55] and environmental guidelines for rehabilitation[56].

While we have no reason to suggest that the mining bond is insufficient to meet the rehabilitation cost, we note that in its recent report *Performance Audit Program 2016–17 to 2018–19*, the Auditor General has noted that it will be auditing

> ……. whether the Department maintains adequate security deposits to cover the liabilities associated with mining rehabilitation, including the decommissioning of infrastructure and any long term post-closure management requirements.[57]

In this context, the Government needs to be satisfied that the mining bond is sufficient to cover any potential liabilities arising from the Project and if there are any shortfalls that this it is not of sufficient scale to substantially alter the estimate of net benefits.

- **For the purposes of our review we assume that the security bond held is sufficient to ensure that any future liability associated with the Project can be appropriately managed in the event of adverse financial position of the company.**

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[55] http://www.resourcesandenergy.nsw.gov.au/miners-and-explorers/rules-and-forms/pgf/environmental-policies

[56] http://www.resourcesandenergy.nsw.gov.au/miners-and-explorers/rules-and-forms/pgf/environmental-guidelines

[57] https://www.audit.nsw.gov.au/ArticleDocuments/298/Performance_Audit_Program_2016-17_to_2018-19.pdf.aspx?Embed=Y

4   Regional economic assessment

The previous chapter presents the CIE's findings in regards to the CBA. The CBA provides a basis on which to assess whether or not the Project will deliver net benefits to the NSW community. The regional economic impact analysis provides a further description of the potential impacts on the regional economy if the Project is approved.

The regional economic impact analysis uses the input-output technique to estimate the direct, flow-on and total economic impacts of the Wallarah 2 Coal Project.

Overall the analysis follows the standard procedures of the input-output technique. But as opposed to a computable general equilibrium (CGE) modelling approach, input-output analysis, and the resultant multipliers, tend to *overstate* the follow-on effect as the analysis is based on some strong assumptions such as a lack of resource constraints, absence of economies of scale, no technological progress (since the data the multipliers were derived from was assembled), and 'average' rather than 'marginal' analysis. And as noted by the Productivity Commission

> [Multiplier] Abuse primarily relates to overstating the economic importance of specific sectoral or regional activities. It is likely that if all such analyses were to be aggregated, they would sum to much more than the total for the Australian economy… In particular, these [multiplier] applications fail to consider the opportunity cost of both spending measures and alternate uses of resources, and may misinform policy-makers.[58]

In other words, by failing to take into account resource constraints and the manner in which an economy adjusts to economic stimuli, multipliers overstate the impacts of economic activities, and potentially overstate the economic impacts.

The degree to which the multiplier analysis overstates the economic impact will be mitigated to some extent by relaxing the full employment assumption (see further below).

The CIE has not verified the multipliers used in the analysis. Typically, multipliers are estimated in terms such as the additional value-added, output and employment generated by a particular industry increasing its output by $1 million. This approach does not appear to have been used here. Rather, the multipliers seem to have been calculated with respect to the wage bill or employment numbers. That is, and for example, the additional wages paid in the economy due to the (net) wage bill in the mining sector increasing by $1 million.

It is also not always clear how the multipliers have been applied to estimate the impact.

Some more specific comments follow.

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58 Gretton, P. 2013, On input-output tables: uses and abuses, Staff Research Note, Productivity Commission, Canberra, page 1.

The logic of the FTE job increase of 72 (Table 5.1) is somewhat challenging to interpret. According to the text before the table

> Assuming that future employees residing in the local area are already employed and that job vacancies created by these people filling the construction and mining positions remain unfilled, …

If employees working at the mine were already employed, and their now vacant former employment positions remain unfilled, then there must be no net increase in jobs. Rather, (a subset) of already employed persons in the region receive a higher income by virtue of working at the mine (construction and operation phases).

On this later issue of net change in income, it would be better to replace the average net income in mining (item b) in Table 5.1 by the average labour income per employee for the Project. In this way, the contribution of the Project to the local income would be better measured. There is also a question mark over using 'Average net income in other industries' as the comparator. Doing so assumes that people employed elsewhere in the region, potentially doing different activities/roles, could gain employment in mine construction or operation. It is not immediately clear that this is a reasonable assumption. A better comparison, if the data were available, would be to use average incomes from other heavy construction/mining activities.

As noted above, it has been assumed that the Project will not see a net change in (direct) employment. As such, using an employment multiplier (Table 5.2) in inappropriate. As the impact of the Project on employment is reflected in higher income, it is, so far as using multipliers is appropriate, legitimate to use an income multiplier to estimate the flow-on effects. Presumably, higher income leads to higher demand, and thus higher employment/income elsewhere in the region. So 'an employment multiplier of income' might be estimated and applied to estimate the employment impact of higher income.

Some environmental and social impacts on the local community (Table 5.3) should be subject to the same multiplier analysis no matter how small the direct impacts are.

Mitigation of some impacts are included in capital and/or operating costs such as flooding, noise impacts, and visual amenity as stated in Table 5.3. Ideally these costs should be separately listed. Further, this may present a problem of painting negative impacts as positive ones. The capital and operating costs to mitigate the adverse impacts may well be included in the non-labour expenditure which are attributed to the local economy as benefits in subsections 5.3 and 5.4.

Separately estimating the impacts of construction equipment purchases on regional economy (tables 6.3, 6.5, 6.7, 6.9) may present double-counting problems. Presumably, the $163m of capital expenditure in the *heavy and civil engineers construction sector* and *construction services* sector must include intermediate inputs from the *specialised and other machinery* and *equipment manufacturing sector* in the local and NSW input-output tables. If so, the direct and production induced effect of output must already include the expenditure on the construction equipment purchase.

According to Table 6.10, an income per employee for the Project of $133 843 per annum can be derived (income of $40 153 000 divided by 300 employees). This is significantly

higher than the average income of mining as reported in Table 5.1 ($96 473). There appears to be no justification for this higher income assumption.

Finally, according to the second dot point on page 70

> The estimated wage bill of employees residing in the region was allocated to the *household wages* row with any remainder allocated to *imports*

Does that mean the 300 operation jobs are employees residing in the region too? If so, presumably there are some employees residing in other NSW regions. If so, then the income and employment numbers for the Project in the whole of NSW (Table 6.12) should be higher than those for the region (Table 6.10).

If the 300 jobs are total employment for the Project, then according to the above quoted dot point, the average income per employee would be even higher than $133 843.

5   Conclusion

In general we conclude that the CBA has been undertaken in a manner that is broadly consistent with the 2015 NSW Government guidelines for conducting mining related applications and the 2007 Guidelines for economic appraisals.

While the analytical approach is broadly consistent, the individual components and parameter estimates warrant testing. Some of the estimates are difficult to test, particularly where there is limited publicly available data on, for example, the cost of the operations. Further, the CBA requires Gillespie Economics to develop assumptions regarding future factors, such as the future price of coal which are volatile.

On the benefits side, *at a minimum*, the NSW Government would receive royalty payments. On the cost side, there are a range of externalities that need to be accounted for. In some instances, these externalities have been mitigated (in full) by the actions of the company. However, there are instances where there are residual impacts that are not fully mitigated. We have relied on the findings presented in the EIS documents and NSW Government agency submissions to the process to understand whether these impacts are likely to be material and would change the conclusion regarding the quantum of net benefits.

Based on alternative assumptions, we would anticipate that the benefits associated with royalties to be between $154m to $257m in present value terms over the life of the Project. This can be viewed as the minimum benefit that could be expected from the Project. On the cost side, the key item relates to the greenhouse gas emissions which ranges from around $27m to $121m in present value terms, depending on assumptions used.

Therefore, even if we assume upper bound estimates of greenhouse gas emissions ($154m) and lower bound estimate of royalties ($121m), the Project is expected to deliver net benefits of around $33m in present value terms. The quantum of the net benefits could be higher if other elements of the benefits stream are included in the analysis, although it is difficult to test/confirm the quantum of these other elements. This, of course, assumes that there are a range of negative impacts that are mitigated in full or have no material impact which is consistent with the findings of the EIS documentation and NSW Government agencies' submissions.

In regards to the regional economic analysis, the use of 'multipliers' is likely to overstate the potential economic impact of the Project. Further, it is difficult to trace through the analysis to understand how the impacts have been derived. Therefore, while the CBA indicates that there are expected net benefits if the Project is approved, the regional economic analysis conducted may not accurately reflect the potential economic impact on the local region.