DRAFT REPORT

Peer review of economic assessment

Mount Owen continued operations project

Prepared for
NSW Department of Planning and Environment

September 2015

THE CENTRE FOR INTERNATIONAL ECONOMICS
www.TheCIE.com.au

The Centre for International Economics is a private economic research agency that provides professional, independent and timely analysis of international and domestic events and policies.

The CIE's professional staff arrange, undertake and publish commissioned economic research and analysis for industry, corporations, governments, international agencies and individuals.

CANBERRA

Centre for International Economics
Ground Floor, 11 Lancaster Place
Canberra Airport ACT 2609

GPO Box 2203
Canberra ACT Australia 2601

Telephone +61 2 6245 7800
Facsimile +61 2 6245 7888
Email cie@TheCIE.com.au

Website www.TheCIE.com.au

SYDNEY

Centre for International Economics
Suite 1, Level 16, 1 York Street
Sydney NSW 2000

GPO Box 397
Sydney NSW Australia 2001

Telephone +61 2 9250 0800
Facsimile +61 2 9250 0888
Email ciesyd@TheCIE.com.au

Website www.TheCIE.com.au

Contents

BOXES, CHARTS AND TABLES

Summary

The CIE has been engaged by the NSW Department of Planning and the Environment (the Department) to peer review the Cost Benefit Analysis (CBA) produced by Deloitte Access Economics (DAE) for the Mount Owen continued operations Project (the Project). The Project is to extend the operations at Mount Owen to 2030 and consolidate the Mount Owen and Ravensworth East operations into one development consent.

DAE estimates that the Project will deliver net benefits of approximately $758 million over the asset life, with a benefit cost ratio (BCR) of 1.3. The analysis quantifies and values a wide range of impacts but excludes a number of potential environmental and social impacts where data is not readily available. DAE concludes that these impacts are unlikely to materially impact on the quantum of net benefits and, therefore, would not alter the conclusion that society is better-off because of the Project.

The CBA has been guided by the NSW Government's November 2012 *Guideline for the use of Cost Benefit Analysis in mining and coal seam gas proposals*. As part of the CBA DAE has employed a range of assumptions to quantify and value the impacts. The CIE's review tests the *reasonableness* of the CBA undertaken by DAE and its consistency with NSW Government guidelines in relation to undertaking CBAs.

- **In general, we conclude that the CBA has been undertaken in a manner that is consistent with the NSW Government guidelines. However, there are a number of issues where further clarification is required.**

DAE have excluded mining operations at the Bayswater North Pit from its baseline calculations because the activity at this mine continues under the Project case. However, if this Project is not approved mining would continue at Bayswater North to 2022 and therefore may be considered part of the current policy settings. DAE has not considered the potential benefits of the consolidation such as reduced regulatory costs.

Including the Bayswater North Pit in the baseline would reduce both benefits and costs of the project. CIE estimates including BNP in the baseline would reduce the estimated royalty income by around 9 per cent to $235.4 million. Without understanding the costs associated with the operation of BNP CIE cannot estimate the BCR.

- **We recommend including the mining activity at the Bayswater North Pit in the baseline.**

In general, CBAs of projects undertaken in Australia incorporate benefits and costs accruing to Australian society as a whole. That is, a project is deemed to be beneficial if it improves the welfare of the Australian society as a whole, irrespective of whether there are net benefits to the NSW community (or local communities within). The November 2012 Guidelines issued by the NSW Government, however, specify that the benefits and costs should be estimated as those that accrue to the "residents of NSW" (p.5). This

would significantly lower the net benefits, given that the costs of the Project occur in NSW and the benefits stream accrues more broadly throughout Australia (including company tax paid to the Australian Government and profits to shareholders within Australia and overseas).

The report includes both changes in GSP and royalty payments — $1.9 billion and $258 million, respectively — as measures of the benefits to NSW. Royalty payments are a good estimate of the *minimum* benefits to the state whereas the GSP measure is not comparable to the CBA calculations.

This *public* benefit can be compared against the estimates of public cost of Project, largely associated with value of external impacts (e.g. air and noise pollution) that DAE estimate to be around $50 million in present value terms. These costs also accrue to the Australian community as a whole. However, because of their proximity to the Project residents of Singleton incur all costs excepting carbon pollution costs and rural and amenity costs. .

1 Public benefits and costs to residents of NSW

	Impact
Benefit to NSW	$m
Royalty payments	258.
Traffic	0.77
Cost to NSW	
Carbon pollution	25.12
Air pollution	13.24
Noise	0.12
Biodiversity	2.22
Rural Amenity and culture	8.04
Residual value of land [a]	2.31
Net public benefit to NSW	207.22

[a] DEA are not clear whether on whether the company or the residents of NSW on the land.

Source: Deloitte Access Economics, Cost Benefit Analysis and Economic Impact Analysis of the Mount Owen continued operation Project, 2015

- **The CIE notes that the CBA does not specifically identify costs and benefits to NSW residents but also acknowledge that the public costs imposed on NSW residents are significantly lower than Royalty payments.**

Benefit and cost estimates are based on a range of assumptions on, for example, the production profile and expected future coal price. In this context, DAE also provides analysis to test the sensitivity of the results to changes in key parameters. The results are most sensitive to changes in the future coal price, which is volatile. If coal prices were 30 per cent lower (as presented in the sensitivity analysis) then this would suggest that the net benefit to NSW (based on royalties) would be approximately $85 million in present value terms.

Although DAE undertake sensitivity testing around the cost of greenhouse gas emissions, the selected range of ±10 per cent does not reflect the uncertainty around these costs.

Using the maximum price achieved in the European carbon market elicits a cost of $85 million in NPV terms to all Australians.

- **We recommend DAE conduct sensitivity analysis over a broader range of assumptions around carbon pollution costs.**

The method DAE selected for calculating air pollution costs is using the value of changes in the concentration of PM_{10} emissions is reasonable. However, the calculation in this report is not replicable and should be checked. Calculation methods using the volume of $PM_{2.5}$ emitted annually are equally valid.

- **We recommend DAE present a range of alternative values using the two methods.**

Finally, DAE's analysis utilises information provided in the EIS documentation. We are not in a position to comment on the robustness of these findings and leave it to experts in the relevant areas. Nevertheless, if at a later stage there are changes to the analysis presented in the EIS documentation the DAE study may also need to be updated to reflect this new information.

- **Based on our review, it appears that the public benefits are likely to exceed public costs, based on the conclusions drawn in the EIS documentation. Any material changes to the EIS documentation should also flow-through to changes in the CBA.**

1 Introduction

About the Project

The Project comprises of

> ….to extract additional mineable coal tonnes through continued open cut methods. This involves:
>
> - continuation of mining activity at the Mount Owen North Pit beyond 2018 to 2030, extracting an additional 74 Mt of ROM coal
> - continuation of mining activity at the Bayswater North Pit, Ravensworth East, beyond 2015 to 2022, extracting an additional 12 Mt of ROM coal
> - sequential mining on the Ravensworth East Resource Recovery from 2022 to 2027, extracting an additional 6 Mt of ROM coal .[1]

The Project involves the expansion of the North Pit by 381 hectares together with a number of infrastructure upgrades, including:

- expansion of existing stockpile
- upgrade and extension of the Mount Owen mine infrastructure
- provision of an additional rail line and northern turn-out
- construction of a rail overpass and removal of the existing level crossing
- construction of a new bridge.

The Project also includes the consolidation of the develop consents for the Mount Owen expansion and Ravensworth East operations.

The Proponent of the Project, Umwelt Australia Pty Ltd commissioned DAE to undertake a CBA and economic impact analysis of the Project as part of the EIS.

Scope of review

The CIE has been engaged by the NSW Department of Planning and the Environment (The Department) to peer review the economic assessment produced by DAE for the Mount Owen continuation Project (the Project). The scope of the review includes an assessment of:

- whether assumptions presented are reasonable, appropriate and suitably justified,
- whether the cost benefit analysis aligns with current best practice,

---

1 Deloitte Access Economics (2014), *Cost Benefit Analysis and Economic Impact Analysis of the Mount Owen continued operations Project*, prepared for Umwelt (Australia) Pty Ltd, p. 16.

- the adequacy of the methodology, analysis and assessment presented in evaluating the economic costs and benefits of the proposed development (for the Proponent, local, region and State),
- the identification of any areas of deficiency (including inconsistencies, overlaps or "double counting") and recommendations to improve or resolve these issues in the assessment, and
- consistency of the assessment with any relevant Government guidelines (e.g. NSW Treasury (2007) Guidelines for economic appraisal and/or the NSW Government (2012) Guideline for the use of CBA in mining and coal seam gas proposals).

2 Cost Benefit Analysis

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 community as a whole is better off or worse off by adopting an option.

A CBA framework is focussed 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.

Impacts are often not known with certainty.[2] 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.

2 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 Key features of a CBA[3]

- Scope – A CBA should include all first round (primary) impacts both direct and indirect but not secondary impacts.
- Estimating costs and benefits – A net public benefit or cost of a project can be calculated through the net benefit of a project less any associated public expenditure and any negative social, health or environmental 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 projects should use a 50 year timeframe and a residual value where applicable, but this does not preclude a longer time-frame.
- 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

The NSW Government's November 2012 Guidelines specifies the key features of a CBA in mining and coal seam gas proposals. These are summarised in Box 2.

Defining the scope of the Project

The NSW Government's Guidelines for Economic Appraisal provides the following guidance for defining the scope of a project:[4]

> The scope of the project to be evaluated is also an important issue. Projects or programs will contain a range of elements related to one another and the point at which a discrete project can be identified will require careful judgement.

Taking this into consideration, our review of the definition of the scope of the project was guided by four questions:

- Was the scope of the CBA appropriate?
- How was the project defined and was this reasonable?
- Were the characteristics and elements of the project identified in sufficient detail to enable a robust analysis?
- Were alternative scenarios identified and considered?

Scope of the CBA

The NSW Government Guidelines provide the following guidance for defining the scope of the CBA:[5]

---

3 NSW Government (2012), *Guideline for the use of Cost Benefit Analysis in mining and coal seam gas proposals*, November, p2.

4 NSW Treasury, NSW Government Guidelines for Economic Appraisal, 2007.

> 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.

The scope of the CBA should include all first round effects but not secondary impacts.

DAE noted that:

> As the CBA is being developed to assist with NSW Government assessment processes, the scope of the CBA will generally be the State of NSW.

The main body of the CBA presents the costs 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 benefits from increased coal production accrue to the owners of the factors regardless of their location.

- **The scope of the CBA generally focuses on the net benefit to Australia as a whole, rather than NSW. The regional impact analysis appears to be used to isolate the NSW component, rather than the localised effects of the changes.**

Project definition

The definition of the Mount Owen continued operation Project (the Project) included the construction and operation of the mine as well as a number of on-site and off-site infrastructure projects. In particular, the project scope included but was not limited to:

- the construction and operation of the mine,
- infrastructure constructed within the Mine Area,
- rail loop and train loading infrastructure,
- the upgrade of public off-site infrastructure.

Detail of project characteristics

The characteristics and elements of the Project that were included in the articulation of the proposal included the:

- mine's location
- type of mine
- duration of the construction and operation phases
- expected extraction rates
- a range of on-site infrastructure projects
- rehabilitation activities.

In particular, the construction phase is assumed to span from 2015 to 2017, with the operating phase extending from 2018 to 2031.

---

[5] NSW Government, Guidelines for the use of Cost Benefit Analysis in mining and coal seam gas proposals, 2012, p.5.

Alternative scenarios

DAE considers only the baseline scenario and the proposed project in this analysis; this may be a function of the relatively straightforward nature of the application.

- **In the absence of an analysis of options, the CBA only provides an indication of the impacts of the Project. That is, there may be alternative options (including different project staging or different mining practices) that may deliver superior results to society. The results of the CBA needed to be interpreted in this context.**

Quantifying and valuing the changes

Our review of the values attributed to cost and benefit categories identified was guided by four questions:

- Was the baseline adequately established?
- What cost and benefit categories were identified, and were these appropriate?
- What cost and benefit categories quantified and valued and how was this done?
- Were the estimated values benchmarked?

Establishing the baseline

The NSW Government Guidelines provide the following definition of the baseline or 'base case':

> The 'base case' is typically a projection of the current land use case including current and committed policy settings. The base case effectively describes a business as usual scenario.

The baseline as described by DAE consists of mining continuing at the North Pit to 2018 and BNP, Ravensworth East to 2015. The assumed extraction of 24.32 Mt and 1.26 Mt are within the allowable extraction limits. DAE acknowledge that extraction rates may vary with market conditions. Assumed rehabilitation activities are in accordance with current approvals.

DAE assume that operations at Ravensworth East cease after 2015 despite acknowledging that mining would continue to 2022 under the current approval. The rationale for this assumption is to measure the incremental benefits of the single development consent. The CIE would argue that the current development consent forms part of 'current and committed policy settings' and should be included in the baseline. The incremental value of changing to a single development consent is the benefit to the Proponent of reduced administration costs. Relative to the current baseline, gross revenue, royalty payments and some costs would be lower.

- **The baseline case for the North Pit assumed is reasonable and consistent with current approvals. The baseline for BNP, Ravensworth East should include provisions under current approvals for additional production to 2022.**

Cost and benefit categories identified

The NSW Government Guidelines include a list of cost and benefit categories that determine the net public benefit of a major project. [6] Table 3 compares this list to the cost and benefit categories identified and valued by DAE and table 4 provides estimates of those benefits and costs valued above zero.

DAE covered all of the key cost and benefit categories identified in the NSW Government Guidelines and included some additional categories including the health of mining employees and decommissioning costs. Of the categories that DAE identified, onsite revenue and financial costs were quantified and valued, while five of the seventeen environmental and health impacts identified by the NSW Government were quantified and valued. These included air pollution, noise pollution, carbon emissions, biodiversity and rural amenity & culture.

3 Benchmarking the identified costs and benefits

NSW Guidelines	Deloitte	
	Identified	Valued
Benefits		
Gross mining	Yes	Yes
Costs		
Exploration costs	Yes	Yes
Capital investment costs	Yes	Yes
Operating costs	Yes	Yes
Rehabilitation costs	Yes	Yes
Public expenditure		
Public expenditure relative to base case	Yes	Yes
Environmental and social impacts		
Water quality	Yes	NA
Streams, alluvial aquifers, or alluvial soils	Yes	NA
Air pollution	Yes	Yes
Noise pollution	Yes	Yes
Visual amenity	Yes	Yes
Traffic impacts	Yes	Yes
Carbon emissions	Yes	Yes
Biodiversity	Yes	Yes
Conservation	Yes	
Quality of open spaces	Yes	
Rural amenity and culture	Yes	Yes
Aboriginal and historical heritage	Yes	

6 NSW Government, Guidelines for the use of Cost Benefit Analysis in mining and coal seam gas proposals, 2012, p.5.

NSW Guidelines	Deloitte	
	Identified	Valued
Increase in mine workers' wages		
Profits of mine suppliers		
Impacts on farmers not elsewhere included	Yes	
Impact on labour supply		
Tourism		
Other effects identified		
Decommissioning costs	Yes	
Health of local residents and employees	Yes	
Other onsite revenue	Yes	Yes
Residual land value	Yes	Yes
Residual capital value	Yes	Yes

Sources: NSW Government, Guidelines for the use of Cost Benefit Analysis in mining and coal seam gas proposals, Deloitte Access Economics, Cost Benefit Analysis and Economic Impact Analysis of the Mount Owen continued operation Project, 2015.

4 Magnitude of the incremental costs and benefits quantified

Parameter	Proposed NPV
	$ million
Gross mining revenue	3 244.04
Operating costs	2 275.90
Capital investment costs	128.30
Air pollution – carbon emissions	25.12
Air pollution – other pollutants	13.24
Rural amenity and culture	8.04
Residue value of land	2.31
Biodiversity	2.22
Traffic	0.77
Noise pollution	0.12

Source: Deloitte Access Economics, Cost Benefit Analysis and Economic Impact Analysis of Mount Owen continued operation Project, 2015

In regard to unquantified social and environmental factors, the NSW Government Guidelines state that:

> As has been stressed, some impacts may not be quantified. For example it may be very hard to quantify the amenity effects of a change in land use from a traditional rural use to a mining one. Unquantified impacts should be discussed in the CBA report. However, it should be stressed that these impacts should be viewed in the context of the quantified net public benefit or cost. If there is an estimated net public benefit, do these factors offset this benefit? It would be inappropriate to set up an arbitrary point scoring system as an alternative measure of the net public benefit or cost. The preparation of a CBA report should be explicit regarding assumptions and include discussion of any qualitative impacts.

The impact of not valuing the social and environmental categories above on the final cost benefit ratio depends in part on the potential scale of the impacts and the extent to which mitigation programs developed by the Proponent may help to offset these costs. DAE noted that the impacts of the Project on the following categories were assessed to be negligible or non-existent: surface water quality, subsidence, visual amenity, quality of open spaces, historical heritage, and health.

These assumptions are based on DAE's interpretation of various independent impact assessments conducted as part of the overall Environmental Impact Statement.

The CIE has reviewed the impact studies related to the social and environmental factors above and believes that it is reasonable to assume that these unquantified impacts are unlikely to materially impact on the final cost benefit ratio.

- **The CBA identified a broad range of cost and benefit categories Of these categories, revenue, financial costs, and six of the seventeen environmental and health impacts identified by the NSW Government were quantified and valued.**

Valuing cost and benefit categories

A review of the values attributed to the cost and benefit categories involve assessing the methodology, assumptions, and data sources used to value the categories. Table 55 shows the methodology, assumptions and data sources used to estimate the value of cost and benefit categories identified above. Most of the revenue and financial cost forecasts used in the CBA were sourced directly from the Proponent. The environment impacts valued included: air pollution, noise pollution, carbon emissions, biodiversity, and rural amenity and culture.

5 Cost and benefit categories identified

Costs and benefits quantified	Methodology	Key assumptions	Sources of data
Benefits			
Gross mining/onsite revenue	▪ Product of price and production forecasts.	▪ 90 per cent of coal production will be thermal coal ▪ The peak product extraction rate does not reach the proposed maximum extraction rate. ▪ Price of semi-hard coking coal will be around $15 lower than the price forecasts of high quality coking coal	▪ Umwelt ▪ Consensus forecasts
Traffic	▪ Product of change in travel time and value of time	▪ Construction activities will delay traffic but mining operations will not ▪ Constructing the	▪ Transport for NSW

Costs and benefits quantified	Methodology	Key assumptions	Sources of data
		overpass and bridge will lower travel times	
Costs			
Capital investment costs	▪ Includes roads, rail, storage facilities, and exploration costs.	▪ Investment phase is 2015 to 2017. ▪ Investments total $152 million in the Project scenario.	▪ Umwelt
Operating costs	▪ Includes rehabilitation costs, and excludes royalties, council rates or taxes. ▪ Measured as $ per tonne	▪ Operating costs range between $54 and $88 Project scenario.	▪ Umwelt
Decommissioning costs	▪ Valued at $45 million in the baseline and $67 in the Project..	▪ Includes all mine sites.	
Related public expenditure	▪ Valued at 0.	▪ Costs deemed insignificant.	
Air pollution – carbon emissions	▪ Calculate the product of the quantity of carbon emissions and the cost these emissions.	▪ A constant price of $AUD 8.91 per tonne of emissions. ▪ Includes only Scope 1 emissions.	▪ Intercontinental Exchange European Climate Exchange European Union Allowance. ▪ Greenhouse Gas Assessment
Residual land value	▪ Estimate the change in land value associated with mining activities	▪ Considers both agricultural and native vegetation values	▪ NSW Office of Environment and Heritage Biobank ▪ Derived from NSW Department of Primary Industry
Air pollution – particulate matter	▪ Estimate the quantity of PM_{10} emitted under the Project case and calculate the health costs associated with these emissions	▪ A unit damage cost estimate of $3.80 per ug/m^3 of PM_{10}	▪ Department of Environment of Conservation (2005) for the Hunter Valley as a whole.
Noise pollution	▪ Calculate the product of the dB(A) exposure of residential properties within proximity to the site and the cost associated with the exposure.	▪ $62.38 per Db(A) per households per year.	▪ Navrud (2002).
Biodiversity	▪ Costs of managing proposed Biodiversity Offset Area considered only.	▪ Lifetime management costs are $3 318 per hectare of land.	▪ NSW Office of Environment and Heritage Credit Calculator.

Costs and benefits quantified	Methodology	Key assumptions	Sources of data
Rural amenity and culture	▪ Assess the number of people that are likely to leave the area and the associated costs to the community.	▪ Those households that have properties that meet acquisition criteria will leave the area. ▪ Australian households are willing to pay an average of $012 in perpetuity for each person retained.	▪ Bennet, van Bueren and Whitten (2004).

Source: Deloitte Access Economics, Cost Benefit Analysis and Economic Impact Analysis of the Rocky Hill Coal Project, 2014

- **Broadly speaking, the assumptions and methods were in line with NSW Government Guidelines. However, there are a range of issues noted below that require further consideration.**

Benefits category

The benefits of the Project arise from the amount of saleable coal and the price of this coal.

Production volumes

DAE project the Project will result in 77.20 Mt of saleable coal between 2014 and 2030 compared with 25.58 Mt produced between 2014 and 2018 under the reference case. The reference case only includes production at Bayswater North to 2015. Under the Project, thermal coal is expected to account for 90 per cent of the additional coal produced.

In its analysis of the Project the Resources and Energy Division of the NSW Department[7] of Trade and Investment (the Division) verified the mine contains the resources assumed in the Project analysis.

The expected production profile from the mine will depend on a range of factors including the expected demand for the coal as well as the price for coal.

There is considerable uncertainty around the *extent* to which global demand for coal will continue to increase as the world's energy requirements grow. Over the past decade, coal has 'met nearly half of the rise in global energy demand' and grew faster even than total renewables.[8] However, overall energy demand and the role of coal-fired electricity in the energy mix depends heavily on the greenhouse gas emissions policy decisions made by countries, particularly India and China, which account for almost three quarters of projected non-OECD coal demand growth.

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

8 International Energy Agency, 2012. *World Energy Outlook 2012.*

- **While there is uncertainty regarding the future production profile from the mine, it is expected that there will be a sustained demand for the product over the timeframe of the Project.**

Coal prices

Coal prices determine the revenue received from the sale of the coal. They can also affect the production profile, given their impact on the profitability of the mines.

In its analysis, DAE assume a 2014 price for thermal price of around A$90 per tonne rising to around A$100 in 2020 and then stabilising. Semi-coking prices are assumed to be around A$15 per tonne higher than the assumed thermal coal prices. These estimates were derived from information provided by the Proponent using an assumed exchange rate that declines gradually from US$0.92 to US$0.83.

Long-term forecasts of coal prices are hard to benchmark given the limited availability of publically available forecasts. Recently, both coal prices and the Australian exchange rate have been trending down.

The Bureau of Resources and Energy Economics (BREE) provides the most recent forecast of future coal prices, although these forecasts only extend to 2019.

The key uncertainty in the royalty calculation is likely to be the world coal export price. In its more recent assessment in regards to the Project, for example, the Division has used

> …. the current low short term coal prices and medium to long term export thermal prices in the range of $A97 to $117 per tonne.[9]

Independent data from the Australian Government's Department of Industry provides another point of comparison. In regards to thermal coal, it indicates that

> Benchmark prices for the Japanese Fiscal Year 2015 (JFY, April 2015 to March 2016) settled at US$67.80……..Benchmark prices for JFY 2016 are forecast to settle at 9 per cent lower at around US$62 a tonne, underpinned by continued oversupply and an assumed depreciation of the Australian dollar.[10]

This equates to around US$61 per tonne, in real terms.[11] Based on the current exchange rate (as at 4 September 2015) of AUD 0.70 per US dollar, forecast prices in 2015/16 would be around A$87 per tonne for export thermal coal.[12]

In regards to thermal coal BREE noted that at current spot prices (around US$73 per tonne),

---

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

10 Australian Department of Industry, (2015) *Resources and Energy Quarterly*, June 2015, p.28.

11 Australian Department of Industry, (2015) *Resources and Energy Quarterly*, June 2015, Figure 4.2.

12 http://www.rba.gov.au/statistics/frequency/exchange-rates.html

> Many producers are unprofitable, which is expected to support further cost-cutting measures and signals the risk of more mine closures or production curtailments over the remainder of the year.[13]

For semi-soft coking coal forecast prices are closer to US$60 per tonne[14] which equates to a future export price of AUD$86 per tonne.

The current trends towards lower coal prices and exchange rates have the potential to balance each other.

- **While there are significant uncertainties regarding future prices, DAE's assumptions are reasonable. The price utilised by DAE for semi-soft coking coal is slightly higher than that projected by the BREE although there may be differences in the quality of coal produced. DAE's sensitivity analyses provide an indication of the impact of lower future coal prices on the results.**
- **In this context, the production profile assumed in DAE's modelling may present a slightly optimistic scenario. However, in the absence of more detailed data, DAE's assumptions are reasonable.**
- **However, the overall production volumes would fall if, as recommended, the BNP production between 2015 and 2022 were excluded from the analysis of the Project case. The NPV of revenue would fall by slightly more given that the BNP production occurs in the early years of the project where discounting has a relatively small effect.**

Royalties

The minimum benefit to NSW residents of the Project is the royalties paid to the NSW government. Based on the Proponent's production and price assumptions, DAE estimate the total royalty payment to be $258m in NPV terms.

The Division, assuming the identical production profiles and prices ranging between $77 and $117 for thermal coal and an additional $20 for semi-coking coal estimate the total royalty to be $280 million discounted at 7 per cent. Being an open-cut mine, the applicable royalty rate is 8.2 per cent. The Proponent is entitled to a discount of $4.50 per tonne.

The royalties are subject to the same uncertainties around coal price that affect gross revenue. The royalty revenue accruing to the government from the BNP mine will occur regardless of whether the project precedes and should not be included in the analysis. To estimate the effect excluding the BNP mine from the baseline on the royalty calculation, CIE has estimated the potential royalties based on the following assumptions derived from the DAE report:

- 12 Mt of ROM extracted at a rate of 1.7 Mt per year from 2016 to 2022
- converting to 1.13 Mt of saleable coal per year of which 90 per cent is assumed to be thermal

---

13 Australian Department of Industry, (2015) *Resources and Energy Quarterly*, June 201. p.45.

14 Australian Department of Industry, (2015) *Resources and Energy Quarterly*, June 2015, p.24.

- coal prices, the discount rate and royalty rates are equal to those assumed by DAE.

The resulting estimate for royalty income is $235.4 million in net present value terms, which is around 9 per cent lower than the DAE estimate.

- **DAE's assumptions underlying on revenue and royalty outcomes are optimistic but reasonable if the revenue from the BNP mine is excluded.**

Traffic

DAE consider both the potential increase in travel times arising from the construction and operation phases and the reduced travel times arising from the Proponents investment in a new bridge and rail overpass. Estimates for the changes to travel time source from the Traffic Impact Assessment and DAE use Transport for NSW estimates of travel time.

The benefits arising from the improved infrastructure outweigh the costs incurred during the construction phase generating a net benefit to society. DAE assume all the benefits accrue to Singleton residents.

- **The estimation technique and assumptions used in calculating the traffic related benefits are sound.**

Cost category

Operating and capital costs

DAE assume operating costs of between $54 and $65 per tonne in the baseline and between $57 and $88 in the Project. These estimates derive from econometric analysis of open cut mining in Australia undertaken by Shafiee, Nehring and Topal (2009) with the Proponent providing parameter estimates.

Operating costs used in other studies provide some opportunity for comparison. Gillespie Economics (2012), for example, presents the findings from two studies:

- Marston (2010) which estimates the free on board cash cost of mining of approximately A$51 per tonne (in 2010 dollars).[15]
- Ernst and Young (2010) which estimates the operating costs per saleable tonne across all Centennial mines at A$53.6 per tonne (in 2010) of product coal. This includes the costs of levels and royalties, amongst other things, but excludes capital costs.

In 2014 dollars terms, this equates to between A$56 and $60 per tonne of saleable coal. The Australia Institute (2013), on the other hand, argues that the costs are closer to A$90 per tonne (in 2013 dollars).[16] In the absence of specific data on the operating costs of the mines, the operating cost estimates utilised in the DAE study appear reasonable.

---

15 Based on a cost of US$45 per tonne and converted to Australian dollars using an exchange rate of $0.88.

16 The Australia Institute (2013), *Terminal 4 Project -Submission to the preferred project,* November, p.14.

Health costs

DAE reasonably assume that health costs from the Project derive directly from air pollution and indirectly from noise pollution.

Carbon pollution costs

In calculating carbon pollution costs DAE reasonably assume the current price of carbon on the European carbon market, this price isA$8.91. Based on emissions projects sourced from the Proponent the incremental cost of carbon pollution is $25.12 million in NPV terms.

DAE include only Scope 1 emissions in the analysis but note that including Scope 2 emissions (emissions arising from the generation of the electricity used in the mine) would increase carbon pollution costs of the Project by only $4 million.

- **The carbon pollution calculation is sound for the central scenario.**

Air pollution costs

In calculating air pollution costs, DAE use a 2005 Department of Environment and Conservation NSW study to estimate the effects of PM_{10} pollution on residents of the Hunter valley. DAE take the average of the study range and update it to 2014 values to get a cost estimate for the Hunter Valley of $767 million per 1 ug/$m^3$. DAE then multiple this estimate to the contribution of Mount Owen mine to concentration levels at Singleton Heights (based on data from the Air Quality Assessment[17]). The resulting air pollution costs are estimated at $13.2 million in net present value terms.

It is impossible for the CIE to validate this estimate based on the numbers presented in the report. A simple division of the numbers presented in the report suggest the increase in concentration should be around 0.2 ug/m^3 whereas DAE estimate increase at between 0.5 and 0.6 ug/m^3.

- **CIE recommend this calculation be checked.**

Ideally, the cost estimate used for air pollution should:

- reflect an understanding of the conversion from pollutant emissions to ambient concentration, and
- focus on $PM_{2.5}$ where the impacts are known to be higher.

PAEHolmes (2013) provides an up to date estimate of $PM_{2.5}$ effects but on a per tonne basis. Using this study and the Air Quality Assessment estimates of the per tonne increase in $PM_{2.5}$, the estimated costs of air pollution using this method is $27.4 million in NPV terms.

- **CIE recommend presenting a range of estimates for air pollution given the uncertainty around the methodology.**

---

17 Pacific Environment Limited 2014,*Environmental Impact Statement, Air quality assessment* at http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=5850 viewed 18 September 2015.

Noise costs

In regards to noise pollution, the DAE report measures noise pollution impacts by applying a cost value of $62.38 per household the region of the mine. However, DAE do not explain their rationale for assuming that the number of affected residences (112) remains constant over the Project timeframe nor is the rate of inflation specified.

The DAE estimate for noise pollution costs is the high-end estimate from Navrud (2002)[18]. This study uses a contingent valuation technique to estimate the value of transport noise rather than industrial noise. Other evidence suggests the impact of industrial noise is different from that of transport noise.

- **The calculation for noise costs is acceptable; however, noting the uncertainties would be useful.**

Residual land value

To estimate the residual land value, DAE have considered previous uses of the disturbed land, native vegetation and cattle grazing and associated land values for the North Pit. The value of native vegetation is estimated from the Biobank data. The value of the cattle grazing land is derive from the average gross margin for growing early-weaned calves and steers for 12 months, as reported by the NSW Department of Primary Industries.

Residual values are not estimated for Bayswater North because the operation will continue regardless of whether the project continues.

The residual value of land disturbed by the Ravensworth East operation is excluded from both the baseline and the Project scenarios.

- **This calculation appears sound but DAE do not make the current ownership of the land clear meaning it is not possible to determine whether this is a public or private cost.**
- **This assumption appears to be inconsistent with the decision to exclude Bayswater North operations from the baseline.**

Rural amenities and culture

The development and expansion of the mine may also have negative social impacts through the reduction of rural amenity and culture. Where this change causes people to leave the area, the remaining residents may experience a loss of their sense of community.

DAE report an estimated impact of $7.98 million in present value terms. DAE indicates that this "estimate should only be interpreted as an indicative value if the rural amenity and culture impacts of the Project", given the range of assumptions that were required to be made.

---

18 Navrud, S. 2002, *The State-of-the-Art on Economic Valuation of Noise*, available at https://www.econbiz.de/Record/the-state-of-the-art-on-economic-valuation-of-noise-navrud-st%C3%A5le/10009636691

The main method used by DAE to value rural amenity and culture was using the results of a choice modelling study undertaken by Bennett, van Bueren and Whitten (2004). This study investigated household willingness to pay to maintain rural communities, within the context of environmental protection strategies. Using a general survey at the national level, it was found that Australian households were willing to pay an average of $0.09 per year, over a twenty-year period for every 10 people that are retained in country communities.

Converting the annual payment into a perpetual payment (and updating the figures to 2014 dollars), DAE estimates that each of the 9.1 million Australian households would be willing to pay $0.12 to avoid a single person leaving the rural community. It is assumed that there will be 3 privately owned residential properties that meet the acquisition criteria and will be relocated .This equates to around 8.1 persons, using the 2011 Census data. DAE note that it is difficult to know whether these families will choose to relocate and, if so, whether they will relocate to within the community. DAE has assumed that the families will relocate in 2018.

Appendix C of the DAE report acknowledges that there are challenges in applying the choice modelling results relating to rural amenities and value to the Project. It reports the findings of a number of alternative choice modelling studies. DAE notes that the Gillespie and Bennett (2012) study "is likely to be the most relevant estimate for the value of rural amenity and culture in the context of mining activity". Given this, it is not clear why DAE have not used this study.

- **Further clarification is required from DAE on the reasons for not utilising the more recent and relevant studies.**
- **Estimates of the impacts on 'rural amenities and culture' should also be presented utilising the 2012 study as sensitivity analysis.**

Assessment of biodiversity

Biodiversity includes all plants, animals, fungi, bacteria and other micro-organisms in the natural environment. It encompasses three components: genetic diversity, species diversity and ecosystem diversity, which comprise composition, structure and function.

According to the NSW Government's Guidelines, valuation techniques such as hedonic pricing and willingness to pay should be used to estimate costs to biodiversity in coal mining projects. However, in their analysis, DAE have calculated the costs of Umwelt's offset strategy to mitigate any loss in biodiversity. The costs associated with the management of these offset areas have been calculated to be $3 318 per hectare of land as an estimate of the lifetime costs of offset management, in line with the NSW Office of Environment and Heritage Credit Calculator, updated to 2014 prices. As it is likely that these costs will be incurred from 2015, total offset management costs under the Project case are estimated at $2.22 million in present value terms, using a 7 per cent discount rate.

Although this is considered an appropriate method of valuing the cost of loss of biodiversity due to the project, an implicit assumption of this method is that there are no other loss in value beyond the cost of mitigation measures. However, Bull et al. (2013)

put forward that the requirements for demonstrably achieving no net loss are often undefined. There is an implicit assumption that the baseline for biodiversity is fixed at the point of the project, however ecosystems are generally dynamic. Furthermore, the outcomes of offset schemes may be uncertain and there can also be temporal gaps between impacts from the project and benefits from a rehabilitation plan. [19] Therefore, the incremental costs included in the CBA may potentially be understated.

- **The method used here is acceptable but may understate the costs of biodiversity losses.**

Visual amenity

Radial analyses, panoramic photographs and visual montages show the loss of visual amenity under the project are the same as residents experience under the baseline. The Proponent expects that proposed rehabilitation will minimise the visual impacts of the project. Therefore, DAE have not assigned at quantitative value to visual amenity.

- **The method for assessing visual amenity appears sound.**

Generating the future stream of benefits and costs

The NSW Government Guidelines provide the following guidance for conducting the CBA:[20]

> The costs and benefits should be estimated over the timescale of the impacts of a project. Where a project has environmental impacts, the impacts may continue well after the productive life of the project under construction. It is recommended that long-term projects should use a 50-year time-frame and where applicable a residual value for impacts beyond that time period.

The Guidelines also states that a discount rate of 7 per cent per annum should be utilised with sensitivity testing at 4 per cent and 10 per cent per annum. This was undertaken by DAE in its CBA.

Taking this into consideration, our review of the calculating the future stream of benefits and costs was guided by two questions:

- Was the timeframe used appropriate?
- Were residual values identified and considered?
  - for example, environmental impacts that occur after the operational phase ends

Was the timeframe used appropriate?

The timeframe used covers the investment and operation phases of the project and where relevant the rehabilitation phase. The total timeframe extended from 2015 to 2034.

---

[19] Bull, J.W, Suttle, K.B., Gordon, A., Singh, N.J., and Milner-Gulland, E.J. (2013), 'Biodiversity offsets in theory and practice' in *Fauna and Flora International,* pp. 1- 12

[20] NSW Government, Guidelines for the use of Cost Benefit Analysis in mining and coal seam gas proposals, 2012, p.8.

The rational or basis for this assumption was not provided, but is presumably based on an assessment of the volume of deposits available within the mine area boundary. The expected lifetime of the project was in turn used as the timeframe for the cost benefit analysis.

Were residual values identified and considered?

A number of the cost and benefit categories valued by DAE were contained within the project lifetime – for example, revenue, financial costs, and noise pollution. Where appropriate, DAE considered residual impacts of the Project, including the residual value of the land.

- **The timeframe used for the CBA analysis was the expected lifetime of the Project. Where necessary, DAE considered residual impacts that may occur after the assumed end of the lifetime of the Project.**

Uncertainty and sensitivity analysis

The NSW Government (2012), "Guidelines for the use of Cost Benefit Analysis in mining and coal seam gas proposals" provides the following guidance for conducting sensitivity analysis:[21]

> The CBA should also provide sensitivity tests that show the outcome of a project may vary with plausible alternative estimates of the main uncertain quantified costs and benefits and for a range of discount rates.
>
> Sensitivity tests show the estimated outcomes may vary with variations in key assumptions. To be useful, these tests should indicate how likely the tested scenarios are. Sensitivity tests are useful if there is a plausible likelihood of the alternative estimates being correct.
>
> A discount rate of 7% should be used and tested at 4% and 10%. All costs and benefits should be discounted by the same rate.

Taking this into consideration, our review of the sensitivity analysis conducted was guided by four questions:

- What are the main uncertain quantified costs and benefits and were they included in the sensitivity analysis?
- Were plausible scenarios used?
- Was the methodology used appropriate, and in particular, were correlations with other relevant variables considered?[22]
- Were multiple discount rates applied?

---

21 NSW Government, Guidelines for the use of Cost Benefit Analysis in mining and coal seam gas proposals, 2012, p.8.

22 For example, in testing the sensitivity of the net present value of the project to changes in coal price forecasts, it may be necessary to also consider how the volume coal production may change under different price scenarios.

What are the main uncertain quantified costs and benefits?

Table 4 shows the magnitude of the costs and benefits quantified by DAE. The three cost and benefit categories that were estimated to have the largest impact on the overall net present value of the project were:

- gross mining revenue,
  - which is the product of coal price and production volume forecasts
- operating costs per tonne, and
- capital investments costs.

Table 6 below shows that coal prices, operating costs *per tonne*, capital investments costs and carbon prices were included in the sensitivity analysis, while production volumes were not. Given that the lower coal price scenario generates a negative NPV and that low prices may lower production levels this omission is of concern.

The relatively small range over which the carbon emissions are tested are also of concern. While choosing the current European price is a reasonable assumption for the central scenario, DAE itself notes the large variability in the estimates for the social costs of carbon. Even the European market price has been subject to volatility, peaking at over 30/t in 2008 to lows under 5/t in 2013[23]. Therefore, a far greater range of estimates would be appropriate. Assuming a carbon price of $30/t would result in carbon pollution costs approaching $85 million in NPV terms to all Australians.

6 Parameters included in sensitivity analysis

Net benefits	Variations	Project financials	Variations
Coal price	± 30%	Coal price	± 30%
Capital investment	± 25%	Capital investment	± 25%
Operating costs	± 10%	Operating costs	± 10%
Carbon emissions	± 10%	Discount rate	4 to 10%
Discount rate	4 to 10%		

Source: Deloitte Access Economics, Cost Benefit Analysis and Economic Impact Analysis of the Rocky Hill Coal Project, 2014

Were plausible scenarios used?

In the case of coal price forecasts, the DAE noted that:

> The sensitivity ranges of the coal price were arrived at through an analysis of data over the period from January 1995 to August 2014. For the 30 per cent range, around 66 per cent of the range of historical prices are covered, with the lower sensitivity placed at the 17th percentile of historical coal prices, and the upper sensitivity around the 83rd percentile. In this sense, we consider the 30 per cent price sensitivity is conservative and represents extreme range of prices that could be experienced.

23 Delbeke, J 2014, Framework for Climate and Energy at http://carbonmarketwatch.org/wp-content/uploads/2014/07/22_07_14_Delbeke-EP-EU-ETS-and-MSR.pdf viewed 16 September 2015.

For the other variables included in the sensitivity analysis, no indication of the rationale or methodology used to arrive at the sensitivity ranges was provided.

Was the methodology used appropriate?

DAE provided no indication of the methodology used to produce estimates of the net present value of the project under alternative scenarios. As a result, it is not clear whether the sensitivity analysis was performed by:

1 simply altering the value of the parameters outlined above in line with the sensitivity ranges, or

2 using a more formal approach, possibly with the aid of risk analysis software, that would take into account correlations between key variables.

The first approach is appropriate if the parameters considered are not correlated with other benefit or cost categories. This may not be the case with coal price forecasts, which could be correlated with production volumes and operating costs.

Were multiple discount rates applied?

Consistent with NSW guidelines, Table 6 above shows that sensitivity analysis was performed with discount rates of 4 per cent and 10 per cent. This variation in the discount rate was found to alter only marginally the benefit cost ratio from1.30 to 1.31 and 1.29.

- **Overall, the sensitivity analysis conducted by DAE was not as transparent as it could have been. Furthermore, the methodology used to conduct the sensitivity testing and rational for the sensitivity ranges is not clear in the report.**
- **Discount rates of 4 per cent to 10 per cent were included in the sensitivity analysis in line with NSW Government Guidelines.**
- **Under these alternative discount rates the benefit-cost ratio is 1.31 to 1.29 respectively, indicating a net benefit under all discount rates used.**
- **The sensitivity analysis applied to carbon emissions was not sufficiently broad.**

3 Regional Economic Impacts

In order to analyse the implications of investing in the project, DAE also undertook economic impact analysis utilising a Computable General Equilibrium (CGE) modelling. The rationale behind this correctly identified that a CBA focuses on the Project and its immediate external effects. On the other hand, CGE modelling is used to trace the immediate effects of the Project through the economy more broadly. However, a CGE model is built on the national accounting system and focuses on outputs that are traded in markets and contribute to GDP. Thus a CGE model does not capture environmental and other externality costs that are captured as part of a CBA. Therefore, using results from both a CGE model and a CBA, will provide a broader picture of the impact of the Project although the CBA is still the primary tool that should be used to decide on whether the Project will improve societal welfare.

In order to analyse the regional economic impacts that could not be captured through a CBA, DAE used CGE modelling to estimate how the Project's capital investment, operational expenses and revenues are distributed across the broader economy over time. Modelling was undertaken for the period 2015 to 2031 for the following economic regions:

- **Hunter Valley area** – contains the localities of Singleton, Broke, Central Coast, Cessnock, Gloucester, Greta, Jerrys Plains, Kurri Kurri, Lake Macquarie, Maitland, Muswellbrook, Newcastle and Branxton.
- **New South Wales** – includes the Hunter Valley area and rest of the State.

This was done using the DAE Regional General Equilibrium Model (DAE-RGEM). The DAE-RGEM is a large scale, dynamic, multi-region, multi-commodity computable general equilibrium model of the world economy.

Using CGE modelling to analyse economic impacts

As opposed to using I-O multipliers, CGE models explicitly capture possible price and wage effects on other markets. CGE models can capture these effects through interrelated systems of demand and supply equations for multiple sectors/industries.

CGE models take into account the 'flow-on' or 'indirect' effect of projects. They also impose more realistic economic relationships, including, where appropriate, restrictions on the availability of factors of production (as opposed to I-O multiplier models). Therefore, CGE models are able to capture a wider range of economic impacts, thus making it possible to analyse the distributive effects within the economy at different levels of disaggregation.

However, CGE modelling is limited in its ability to accurately represent highly disaggregated sectors in the absence of purpose built sub-models. Further, CGE

modelling results for measures like Gross Domestic Product and Gross State Product should not be used to infer welfare gains. In their analysis, DAE demonstrated that by undertaking this Project, Gross Regional Product (GRP) for total Hunter region is projected to increase by just below $1.3 billion from coal sales of about $3.2 billion. There is also an impact on the broader NSW economy; the GRP of the 'rest of NSW' is estimated to be $614 million greater in net present value terms over the period 2016-2030. Therefore, State-wide Gross State Product (GSP) is estimated to be $1.9 billion greater (in net present value terms) over the modelling period under the Project scenario.

The employment impacts are also presented at the Hunter region level as well as for the 'Rest of NSW'. In 2020, the number of FTEs employed in the Hunter region is expected to have increased by 1 091 (compared to the case without the Project). Employment in the Rest of NSW is also expected to increase by 127 FTE. DAE suggest this increase is caused by increased demand for mine suppliers in the rest of NSW. The total increase in employment for NSW is 1 218.

DAE does not report the change in real wages in the 'Rest of NSW', this measure together with the increase in FTEs more completely represents benefits to labour.

While CGE modelling is used as a form of economic impact analysis to trace the effects of, in this case investment in the proposed Mount Owen continued operations Project, on gross regional product and employment, these are not in themselves measures of economic welfare broadly comparable to the bottom line of CBA analysis. While resulting gains GSP and GRP are frequently presented as analogous to the welfare gains of CBA, they are not the same measure.

A closer equivalent measure that can be derived from CGE modelling is real consumption (public and private). The net present value of the 'above forecast' change in aggregate private and public consumption, adjusted for any consequent deterioration in net foreign debt over the project life, is a general measure of welfare gain that can be used.

- **The CGE analysis provides understanding of the impacts on regional economic activity and employment but is not a measure of welfare.**
- **Presenting changes in employment and real wages would provide a more complete assessment of employment outcomes for NSW residents.**

Are the model assumptions consistent with the CBA?

The CBA results are the product of *partial equilibrium analysis.* As such, they do not take account of flow-on to other activities through possible price and wage effects of the project on other markets (either in local region, state wide or nationally). The larger the project, the potentially more significant are these effects. CGE models explicitly capture these effects through interrelated systems of demand and supply equations for multiple sectors/industries.

The CGE modelling presents sensitivity analysis based around different coal price trajectories for the Project, whereas, under the CBA different scenarios such as carbon pricing are also examined.

That is, when compared with the base case of 'no project' there is an enhancement of economic welfare as measured by the sum of incremental consumer and producer surplus generated by the project-related investments. Results from the CGE modelling however only compare scenarios where the central case reflects the economic impacts and employment impacts due to the Project assuming forecasted coal price. This is compared to fluctuations in the coal price forecasts by 30 per cent.

Both the CBA and CGE modelling assume that the capital expenditure phase is from 2015 to 2017, with operations commencing in 2018 and continuing to 2030.

- **The CBA and CGE analysis incorporate the same assumptions but the CBA considers more scenarios.**

Impacts on NSW and Singleton

The DAE reports these impacts on NSW and the Hunter region in terms of changes in GSP/GRP as well as employment impacts. As noted above, the CGE model does not incorporate the external impacts, such as degradation of the environment, into the analysis. Further, GSP/GRP are not welfare measures that can be compared with the CBA results.

- **Given this, the results of the CGE modelling should not be interpreted as presenting the net benefit of the Project to NSW.**

Rather, the estimates of royalties provide a more accurate reflection of the (minimum) benefits to NSW that can be expected arising from the Project. DAE has estimated royalties of $258 million in present value terms.

In regards to the benefits to the Singleton community, DAE recognise the difficulty in disaggregating the results to the local level. Based on a range of assumptions, DAE estimates that the net benefit to the Singleton community would be up to $306 million in present value terms.

The assumptions include residents of Singleton receiving shares of the operating and construction costs commensurate with the share of employees and suppliers located in the region. Residents of Singleton are assumed to incur all health and noise costs and all traffic benefits. Singleton residents incurred the carbon emission and rural amenity and culture costs commensurate with their share of the Australian population.

- **All assumptions are not detailed in the report. Therefore, it is difficult to comment on the results.**

THE CENTRE FOR INTERNATIONAL ECONOMICS
www.TheCIE.com.au