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Gillespie Economics Response to CIE Peer Review

BYLONG COAL PROJECT
Environmental Impact Statement

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James Bailey
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Dear James

Re: Response to Centre for International Economics' Peer Review of Bylong Coal Project - Economic Impact Assessment

As requested, Gillespie Economics has examined the peer review of the Bylong Coal Project Economic Impact Assessment prepared by the Centre for International Economics (CIE) on behalf of the NSW Department of Planning and Environment (DP&E).

The CIE review found the Economic Impact Assessment undertaken by Gillespie Economics to be methodologically appropriate and analytically sound. Key findings of the CIE review are that:

- the benefit cost analysis (BCA) identifies and values the major costs and benefits of the Project and uses methodologies for their valuation that are reasonably sound;
- while there are uncertainties 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;
- while there are significant uncertainties regarding future prices, the implied coal price for export thermal coal used in the BCA is reasonable;
- the estimation of royalties from the Project is reasonable;
- residual air quality impacts below government policy thresholds that were not valued in the BCA are immaterial to the analysis i.e. $0.3M in present value terms;
- to the extent that biodiversity impacts are mitigated by the purchasing of land for offsets there are no unmitigated biodiversity impacts that need to be considered in the BCA;
- there is difficulty in placing dollar values on Aboriginal cultural heritage impacts and therefore the approach adopted by Gillespie Economics of leaving these unquantified for consideration by decision-makers against the quantified net benefits of the Project is appropriate;
- the order of magnitude of residual historic heritage impacts is around $1M present value;
- the methodology for valuation of visual amenity impacts appears to be reasonable and that to the extent there are some minor residual visual amenity impacts, this would not have a material impact on the results;
- the BCA uses an appropriate discount rate;

- the time frame used in the BCA is appropriate;
- the sensitivity testing in the BCA covers an appropriate range of variables;
- at a minimum, it is reasonable to expect net benefits to NSW of above $177M. In addition to this, there are public benefits associated with income tax payments to the Australian Government (some of which is distributed to NSW) and broader employment benefits to the community;
- the input-output methodology used for assessing regional economic impacts is reasonable; and
- the estimate of the regional economic impacts of the Project gives a reasonable estimate of the upper bound of regional effects.

Notwithstanding the above, CIE has offered some alternative views to some of the assumptions employed and approaches taken. This is not surprising since applied economics is not an exact science. Many assumptions are contestable at the margin and analyses must make use of available data despite inevitable shortcomings. Therefore any review of a substantial economic analysis, such as that prepared by Gillespie Economics on the Bylong Coal Project, will inevitably raise alternative views on some assumptions or the suitability of various datasets. Of importance is ensuring that the materiality of identified issues to the study's conclusions is clearly articulated. As identified by the CIE review, alternative views in relation to some assumptions and approaches would not have a material impact on the BCAs finding, that the Project will have net social benefits to Australia and NSW.

Detailed comments on the CIE review to clarify some misunderstandings and provide additional justification for the approaches taken in the Economic Impact Assessment are provided in Attachment 1.

Regards

Rob Gillespie

ATTACHMENT 1 - RESPONSE TO CIE ISSUES

Issue (p. 8): CIE is unable to verify the costs and benefits of alternative projects considered by KEPCO

The Economic Impact Assessment identifies that *"the Project assessed in the EIS and evaluated in the BCA is considered by KEPCO to be the most feasible alternative for minimising environmental, cultural and social impacts whilst maximising resource recovery and operational efficiency. It is therefore this alternative that is proposed by KEPCO and was subject to detailed economic analysis."*

This is not meant to imply that the alternatives considered by KEPCO were subject to BCA or that they are more or less economically efficient than the proposal - only that from KEPCO's perspective the Project is considered the most feasible and the proposal that they wish to proceed with. Only this proposal has been subject to detailed BCA.

Issue (p. 9): CIE identifies that the Economic Impact Assessment includes consideration of the increase in mineworker's wages

Conservatively, the BCA does not include any potential wage increase benefits to workers. Refer to Section 4.4.2 of the Economic Impact Assessment where this potential benefit is only discussed conceptually.

Issue (p. 9): Table 3 in the CIE report identifies a range of impacts not included in the BCA including exploration costs, public expenditure, water quality, streams, visual amenity, traffic impacts, rural amenity and culture, Aboriginal heritage, impacts on farmers not elsewhere included

This implies some omission by Gillespie Economics. However, all relevant impacts were considered in the BCA either qualitatively or quantitatively. For instances, exploration costs are sunk costs and irrelevant to the BCA. No public expenditure, water quality impacts, impacts on farmers not elsewhere included, were identified in technical assessments and so these were not included in the BCA. Other impacts such as Aboriginal heritage, visual amenity, traffic impacts, air quality impacts were addressed qualitatively, and for some quantitatively, in the BCA.

Issue (p. 10): CIE states that Gillespie Economics does not consider, even qualitatively, some costs, including water quality, health and conservation

Health impacts are explicitly addressed under Air Quality Impacts in Section 4.4.2 of the Economic Impact Assessment.

Conservation impacts are explicitly addressed under Ecology Impacts in Section 4.4.2 of the Economic Impact Assessment.

Water quality is not explicitly included because no water quality issues were identified in technical assessments throughout the life of the Project and all discharges are required to be licensed by the NSW EPA so as not to have a significant impact.

Issue (p. 13): CIE repeatedly makes the statement that Gillespie Economics assumes that mitigation costs equal social costs

Acquisition and mitigation costs are not the same as social impact costs and nowhere in the Economic Impact Assessment is it claimed that they are. Gillespie Economics has included the acquisition and mitigation costs in the direct economic costs of the Project and then given consideration to the residual externality impacts. Acquisition and mitigation costs are often less than the social damage costs. However, by undertaking these expenditures, larger social impact costs can be mitigated. It is a subtle but important distinction.

Issue (p. 13): The consolidation of many social costs into aggregate operating and capital costs makes validation difficult. This, in part is likely to reflect the challenge in reporting confidential data

It is not social costs that are aggregated into operating and capital costs but mitigation costs to ameliorate or minimise social costs. As suggested by CIE, the aggregation of mitigation costs into operating and capital costs is a direct result of the limitations in reporting confidential data and the fact that some mitigation costs are part of normal operating costs. However, an important point here is that since the BCA is required to be undertaken from a NSW perspective, capital and operating costs have no impact on the primary benefit (i.e. royalties) accruing to NSW.

Issue (p. 14): Gillespie Economics states that it sourced coal price estimates from Wood Mackenzie but do not provide these estimates

Wood Mackenzie is a leading global energy, metals and mining research and consultancy group. Coal price forecasts are proprietary and were provided under a commercial arrangement. It is a breach of this commercial arrangement to publish this information.

Nevertheless, as identified by CIE:

'While there are significant uncertainties regarding future prices, the implied coal price of A$90-A$100 per tonne for export thermal coal prices used in the CBA is reasonable' and *'broadly consistent with the NSW DTI's previous advice on expected future thermal coal prices'.*

In its recent assessment of the Mount Owen mine extension, the NSW Department of Trade and Investment has suggested medium to long term export thermal prices in the range of $A97 to $117 per tonne[1].

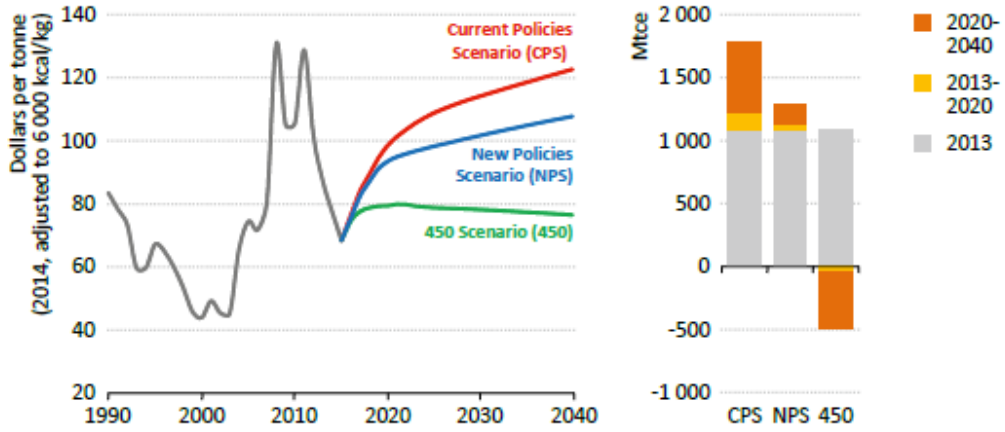
The International Energy Agency (IEA) (2015) World Energy Outlook under the Current Policy Scenario and New Policy Scenario[2] forecasts thermal coal prices increasing rapidly until 2020 followed by divergence in price under the New Policy and Current Policy Scenarios. Under the Current Policy Scenario and New Policy Scenario and an AUD/USD exchange rate of 0.72, the free-on-board thermal coal price in 2020[3] is AUD102/t and AUD121/t, respectively (in 2014 dollars).

[1] As reported in CIE (2015) Peer review of economic assessment, Bylong Coal Project.

[2] The New Policy Scenario takes account of broad policy commitments and plans that have been announced by countries, including national pledges to reduce greenhouse-gas emissions and plans to phase out fossil-energy subsidies, even if the measures to implement these commitments have yet to be identified or announced. The Current Policy Scenario assumes no changes in policies.

[3] Adjusting IEA figures which are import prices for sea freight costs to convert them to export prices.

Figure 7.3 ▷ Average OECD steam coal import prices and global coal trade by scenario



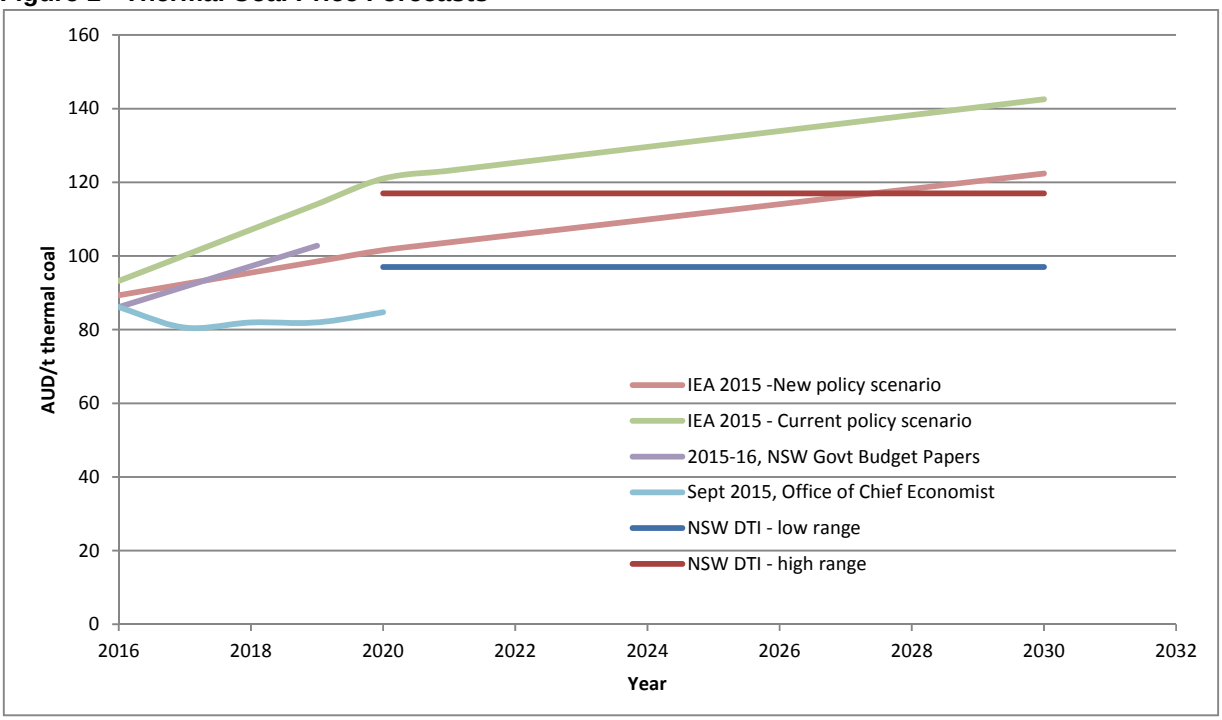
Source: IEA (2015) Work Energy Outlook, p. 274

The NSW 2015-2016 Government budget papers forecast the price of thermal coal in 2019 at AUD103, assuming an exchange rate of 0.72.

In contrast to these forecasts, the Office of the Chief Economics Resources and Energy Quarterly, September Quarter 2015 has thermal coal prices of USD61 (AUD85 at 0.72 AUD/USD exchange rate) in 2020, although this forecast only extends to the first year of Project operation. It should be noted that it is not current or historic coal prices or even short term prices forecasts that are relevant to the analysis but forecast prices during the 23 years of mining operations, where the operations would not commence until around 2020. Hence the relevant coal price for the BCA is the price from 2020 onwards.

The varying forecasts of thermal coal prices are shown in Figure 1. It is recognised that there is uncertainty around future coal prices (valued in USD), as well as the USD/AUD exchange rate. Therefore, the BCA of the Project included sensitivity testing of +/- 20% in the AUD coal price. At CIE's suggestion, additional sensitivity testing for +/- 30% changes in AUD coal price is provided later in this Attachment. This encompasses even the most pessimistic forecasts price of the Office of the Chief Economist.

Figure 1 - Thermal Coal Price Forecasts



Issue (p. 15): Without detailed data from independent sources it is difficult to test the validity of the operating cost assumptions used

Mining operation costs vary from mine to mine. There is an Australian cost curve of suppliers to the market ranging USD35 to USD70 free-on-board in 2014 (International Energy Agency (2015) Medium Term Coal Outlook - see Figure below). This cost curve is not static but can respond to price pressures e.g. it has shifted to the right in recent times as there has been a reduction in typical average costs of mine operation as a result of price pressures (IEA, 2015). Given the broad range in supply costs of Australian coal mines and the shifting of the supply curves in recent times, benchmarking of the average operating cost of the proposed mine to "*test the validity of the operating cost assumptions*" would be a questionable exercise.

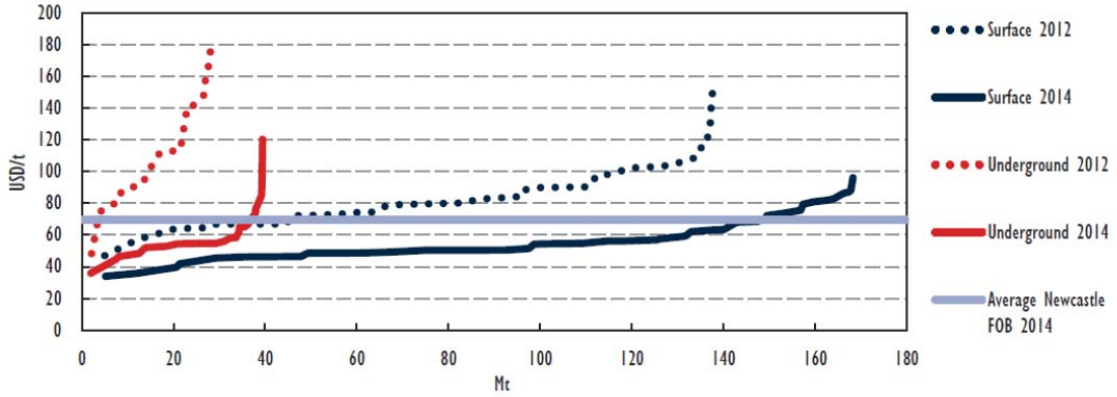
Notwithstanding, CIE's estimate of the average operating cost for the Project (excluding royalty costs) at AUD59/t compares to operating costs reported in the publicly available reputable literature of between AUD56/t and AUD60/t (Marston 2010 and Ernst and Young 2010)[4] and places the Project in the middle of the costs curves in the above figure.

The operating cost (and capital cost) information for the proposed mine was not sourced from an independent assessment undertaken for the Proponent by Parsons Brinckerhoff. Operating costs were built up from first principles logic using costs from the RungePincockMinarco (RPM) mining cost database and manufacturer's information.

[4] Marston, J. (2010) The Competitive Cost of Coal – Analysing the Major Producing Areas of the World, presentation to Coaltrans Asia, Bali International Convention Centre, Indonesia, 30 May to 2 June 2010.

Ernst and Young (2010) Independent Expert's Report and Financial Services Guide: In relation to the takeover offer for all of the shares of Centennial Coal Company Limited

Figure 2.22 Comparison of Australian steam coal supply cost curves for surface and underground mines in 2012 and 2014



Note: coal volumes, prices and costs are based upon a calorific value of 6 000 kcal/kg.

Source: IEA analysis from Wood MacKenzie (2015), *Coal* (private database), accessed April 2015; IHS Energy (2015), *Coal McCloskey Price and Statistical Data*, https://connect.ihs.com/industry/coal.

Issue (p. 16): The Proponent should be requested to separately itemise the costs associated with the mitigation activities to provide greater transparency on the actions proposed

This information is commercial-in-confidence. The actions proposed are outlined in Section 2.3 of the Economic Impact Assessment and elsewhere in the EIS. Mitigation costs are a very small component of mine operating costs and substantial changes to their levels has little impact on the outcome of the BCA. Sensitivity analysis of plus and minus 20% of the capital and operating costs undertaken in Section 4.7 of the Economic Impact Assessment is more than enough to cover substantial variations in the costs of mitigation actions. It is unclear how itemisation of mitigation costs would add any value to the analysis.

Issue (p. 16): Gillespie Economics has sourced capital and operating costs from the proponent

Both capital and operating costs were sourced from an independent assessment of the Project by Parsons Brinckerhoff that specifically costed the Project.

Issue (p. 17): For the purpose of CBA an appraisal of air quality impacts should evaluate the impacts of a change in air pollution regardless of whether air quality standards are met because there is no known threshold for health effects resulting from particulate matter

Three aspects guided the consideration of air quality issues in the Economic Impact Assessment:

- the results of the Air Quality Assessment undertaken in accordance with Government policy;
- the available medical research; and
- the principle of only considering impacts that may be material to the BCA (NSW Government 2012; NSW Government 2015).

Economists undertaking BCA rely on the input of technical specialists who prepare their assessments in accordance with Government guidelines and policy. *The NSW Voluntary Land Acquisition and Mitigation Policy* (DP&E, 2014) and *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (EPA 2005) include assessment criteria to protect the amenity, health and safety of people. The assessment of air quality impacts at nearby properties indicated that there are no properties that will be

impacted by exceedances of the relevant air quality criteria (PEL, 2015). Consequently, it was assumed that there are no **material** economic costs for inclusion in the BCA.

Supporting this assumption, the Economic Impact Assessment also refers to medical research by NSW Health and a NSW Health Fact Sheet. The medical research is that undertaken by Merritt, T., Cretikos, M., Smith, W. and Durrheim. D. (2013) *The health of Hunter Valley communities in proximity to coal mining and power generation, general practice data, 1998-2010*, NSW Public Health Bulletin, Vol 24(2), NSW Health. This reports an analysis of general practice data for rural communities in close proximity to coal mining and coal-fired power generation in the Hunter Valley region of NSW and found that there is no significantly higher rates of problems managed or medications prescribed for Hunter region residents compared with the rest of rural NSW. It is therefore unlikely that a single mining project that meets government air quality criteria at nearby properties will have any material health impacts due to air pollution for inclusion in the BCA.

The NSW Health Fact Sheet - Mine Dust and You - states "*Provided that mines are operated with proper dust controls it is unlikely that healthy adult residents would suffer any serious health effects from the expected exposure to particulate matter*."

Notwithstanding the above, CIE consider that the BCA should still attempt to value the residual health impacts. Based on application of unit values for PM2.5 emissions from the United Kingdom, CIE estimate the health costs of the Project at $0.3M, present value. This is clearly not material from a mining related BCA perspective where the net social benefits of the Project to NSW have been estimated at $314M, present value.

Issue (p. 20): The rational for the attribution of 1% of the total cost of greenhouse gas emissions to the Project is unclear

The rationale is that NSW Guidelines for BCA of mining projects (NSW Government 2012; NSW Government 2015) identify that Project proponents are required to prepare a full BCA for NSW, which quantifies and attributes to NSW all the incremental costs and benefits of the Project.

A considerable portion of the guidelines are dedicated to attributing benefits and costs on different geographical scales e.g. NSW residents share of company tax, NSW residents share of the net producer surplus, local areas share of employment benefits. This attribution is based on who bears the costs and benefits rather than where the impacting agent is located. The same principle of apportionment is relevant to greenhouse gas emissions. The prices of carbon used in the Economic Impact Assessment and those used by CIE in its review represent proxies for the global social damage cost of carbon i.e. the cost of carbon emissions to the population of the whole world. It is not appropriate to attribute all these costs to the people of NSW.

Greenhouse gas impacts have no special claim in welfare economics and BCA and when undertaking a BCA from a NSW or Australian perspective should be apportioned in a consistent way with all other costs and benefits.

Issue (p.20) The economic cost of greenhouse gas emissions reported in the economic appraisal is $0.4 million (in NPV terms). The CIE estimates the economic cost of greenhouse gas emissions could range between $23 million and $76 million by applying alternative carbon prices

The Economic Impact Assessment estimates global greenhouse gas damage costs at $38M, present value, in the centre of the range reported by CIE. Consistent with the above discussion, only a proportion

of these damage costs would occur in Australia ($0.4M) and NSW ($0.12M). CIE has attributed all of the impacts of greenhouse gas emissions to households of Australia and NSW.

Issue (p. 20): It is possible that noise costs are fully mitigated but further clarification of this is required from the proponent based on their negotiations with landholders

The outcome of the negotiations with landholders is not relevant to the BCA and in any case it would be impractical to give them consideration in a BCA undertaken before negotiations are completed. The BCA recognises that three receivers are predicted to be significantly impacted, six receivers would be moderately impacted and three receivers would be impacted negligibly. The BCA includes the full acquisition costs of the three receivers[5] and indicative mitigation costs for six moderately impacted properties. No material aggregate economic efficiency impacts are included in the BCA for receivers that were identified as being negligibly or not impacted under the *Voluntary Land Acquisition and Mitigation Policy* (DP&E 2014).

The BCA recognises that to the extent that these measures mitigate noise, then affected properties are no worse off than they were before and no additional material externality costs arise that warrant inclusion in a BCA. However, to the extent that any residual noise impacts occur, after mitigation, these externality costs of a Project would not all be mitigated.

The question from a BCA perspective is the materiality of residual impacts. For instance, if the cost of mitigation for moderately impacted properties needed to be doubled to ensure no residual impacts and mitigation measures of say $50k per property were needed to ensure no residual impacts on negligibly impacted properties, this increases the economic costs by $0.3M, present value (assuming costs are incurred in the first year of production). This is clearly immaterial from an aggregate economic efficiency perspective.

Issue (p. 21): The EIS, p. 333, provides considerable detail around the potential impacts (both positive and negative) on the local community, including impacts on the future status of Bylong Upper Public School. While noting the difficulty in quantifying rural amenities, given the number and type of affected buildings CIE recommend Gillespie Economics considers the issue qualitatively

As identified by CIE, this issue is considered qualitatively in the EIS, p. 333. It is stated that the Project will not impact the operation of key facilities in the Bylong Village. The NSW Department of Education has decided to close the Bylong Upper Public School. However, this is attributable to the lack of enrolments rather than the Project and hence is not a matter for consideration in the Economic Impact Assessment of the Project.

Direct impacts of the Project on Bylong Community e.g. noise impacts, are assessed separately in the Economic Impact Assessment. No significant visual impacts from Bylong Village are anticipated.

[5] So instead of the partial property value impacts being incorporated into the BCA, the full acquisition costs are included. This will overstate the economic impact of noise amenity impacts for significantly impacted properties.

The EIS identifies increased demand for health services and facilities, children's services, education services and training and skill development. These are not normally matters for inclusion in BCA. As identified in the NSW Government (2012, p. 6) *Guideline for the use of Cost Benefit Analysis in mining and coal seam gas proposals*:

> *"The provision of social infrastructure associated with employment and population growth (such as housing and land development, community services, schools and hospitals) should generally not be included as a cost against an economic development. There are two reasons for this. Firstly, some of the services, such as housing, land and community services should be self-financing from any new housing development and should not require a subsidy from existing communities. Secondly, schools and hospitals will be needed generally across NSW to accommodate population growth irrespective of its location. This means that expense in one area is generally transferred from expense in another."*

To the extent that a separate category of general rural amenity impact exists, this can be considered in the threshold value framework. As identified on page 41 of the Economic Impact Assessment:

> "*While the major environmental, cultural and social impacts have been quantified and included in the Project BCA, any other residual environmental, cultural or social impacts that remain unquantified would need to be valued at greater than between $592M and $757M for the Project to be questionable from an Australian economic perspective."*

For NSW, the threshold value is $314M to $479M.

Issue (p. 22): Gillespie Economics has not considered the effects of the project on water quality, either quantitatively or qualitatively

This is correct because it was not identified as an issue of relevance to the BCA. As identified by CIE, if the conclusions of the EIS holds, there is unlikely to be any material water quality impacts throughout the life of the Project that needs to be incorporated in the Economic Impact Assessment.

Issue (p. 23): To value historic heritage impacts applying values from Allens Consulting Pty Ltd is a reasonable approach. However, CIE estimate the heritage value at around $1M compared to Gillespie Economics estimate of $529,000. Clarification is required on the calculations of these costs

The approach taken by Gillespie Economics is outlined in the Economic Impact Assessment, p.39 as follows.

- the average household willingness to pay across Australia for the protection of 1000 additional places ($5.53 per person each year for 20 years) was indexed to 2014 values;
- the 2014 value for protection of 1000 places was discounted to present value using a 7% discount rate;
- the present value was divided by 1000 to get a value per household per site protected; and
- this value was aggregated to 79% of the Australian, NSW and Mid-Western Regional LGA households (as reflected by the survey response rate).

The approach was used by CIE to estimate a value for historic heritage impacts is not stated in its review. However, the difference in value is immaterial from an aggregate economic efficiency perspective.

Issue (p. 24): The rationale for the nonmarket value of employment is unclear. Primarily it is not clear what positive externalities of employment resulting from the Project are being valued

Attachment 6 of the Economic Impact Assessment provides an outline of the academic literature appropriate to this issue and an explanation of the externality being valued. The externality being valued is the willingness to pay of households for the employment of others (altruism). It is a nonuse, public good value. It is no different in concept to nonuse values for the protection of the environment. In welfare economics, individuals are the best judge of their own utility, and if they value the employment of others, which the empirical academic literature shows that they do, then it is a relevant consideration for BCA.

Issue (p. 24): Extrapolation of the nonmarket value for employment across all workers in the mining industry gives a nonmarket benefit of employment in the mining industry of $1B per year. This seems unrealistic

The study from which the value was transferred examined mining employment impacts of 1,170 jobs for up to 31 years. The Project has employment impacts of 290 direct jobs for up to 23 years, within the range examined in the source study. It is inappropriate to extrapolate marginal values from nonmarket valuation studies outside the range of effects within which they were estimated. They are not average values to be extrapolated across the entire mining industry. The extrapolation of marginal values, as average values, has been criticised in the literature most notably in relation to environmental nonuse values as it fails to account for the variation in unit values as the scale of the analysis changes.[6]

Recent literature highlighting this issue includes Rolfe, J., Windle, J., Bennett, J. and Mazur, K. (2013) *Calibration of values in benefit transfer to account for variations in geographic scale and scope: comparing two choice modelling experiments*, Contributed paper at the 57th Australian Agricultural and Resource Economics Society Conference, Sydney, Australia.

Issue (p. 24): A comparison of nonmarket values of employment to unemployment benefits if 20% of mining employees were otherwise unemployed indicates a much lower value

Nonmarket values of employment are public good values. Unemployment benefits are pseudo private good values. Due to the characteristics of non-rivalry and non-excludability the value of public goods is the sum of the values held by all individuals in the community. In contrast, the value of private goods are set by the willingness to pay of the individual marginal consumer. It is inappropriate and irrelevant to compare public good and private good values. For instance, it is not relevant to compare public good values for biodiversity benefits provided by a farm to the private market value of the land.

Issue (p. 24) 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

The Economic Impact Assessment recognises that this is a new area in economic valuation and that some people may view this value as contentious. Consequently, the results of the BCA for the Project are reported “with” and “without” the nonmarket values for employment being included.

Issue (p. 27) CIE recommends the sensitivity testing around the value of coal be changed to ±30 per cent to reflect the volatility in coal prices and potential interactions between other costs

The Economic Impact Assessment undertakes sensitivity testing around the AUD price of coal of +/-20%.

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[6] Pagiola, S., Ritter, K., and Bishop, J. (2004) *Assessment the Economic Value of Ecosystem Services*, World Bank Environment Department Paper No. 101.

For NSW, the Net Social Benefits of the Project for +/-30% AUD price of coal are reported below.

Table 1 - Additional NSW BCA Sensitivity Testing (Present Value $Millions)
(Excluding Non-Market Employment Benefits)

	4% Discount Rate	7% Discount Rate	10% Discount Rate
CENTRAL ANALYSIS	465	314	220
INCREASE 30%			
AUD coal value	629	425	299
DECREASE 30%			
AUD coal value	303	207	147