Mount Pleasant Optimisation Project
Economic Assessment

Cost-benefit Analysis –
Greenhouse Gas Emissions Update

AnalytEcon prepared the 'Mount Pleasant Optimisation Project Economic Assessment' (AnalytEcon, 2021) (the '2021 EA') for the Mount Pleasant Optimisation Project ('the Project'). The 2021 EA included a cost-benefit analysis (CBA) that considered the externality cost of the greenhouse gas (GHG) emissions of the Project.

MACH Energy Australia Pty Ltd (MACH Energy) has updated the Project GHG emission forecasts to incorporate revised fugitive emissions estimates (Todoroski, 2022). AnalytEcon has been asked by MACH Energy to prepare an updated CBA to consider the revised GHG emissions forecast, updated externality costs of GHG emissions, and alternative methods of attributing the externality cost of GHG emissions of the Project to NSW. The updated CBA replaces the results presented in the 2021 EA.

1. VALUATION OF GHG EMISSIONS ESTIMATES

The 2021 EA was prepared in accordance with the NSW Government's 'Guidelines for the economic assessment of mining and coal seam gas proposals' (NSW Government, 2015a; 'the EA Guidelines'), and the 'Technical Notes supporting the Guidelines for the Economic Assessment of Mining and Coal Seam Gas Proposals' (NSW Government, 2018; 'the EA Technical Notes').

The EA Technical Notes require a project's Scope 1 and 2 emissions to be quantified and valued:

> *Accordingly, project proponents should provide an analysis of:*
>
> - *their business-as-usual (BAU) GHG emission output (central estimate) and the expected emissions profile of this central estimate (Scope 1 and 2);*
> - *Estimate the economic impact of GHG emission output to NSW only;*
> - *Undertake a sensitivity analysis on anticipated project GHG emissions output (Scope 1 and 2) at carbon prices below and above the central estimate price.*

Where the valuation of GHG emissions is concerned, the EA Technical Notes state that an appropriate central reference price for the cost of carbon is the forecast price of emission allowances (EUAs) with the European Union Emissions Trading System (EU ETS) based on futures derivatives published by the European Energy Exchange (EEX).

2. 2021 EA VALUATION OF GHG EMISSIONS

Consistent with the Technical Notes, the following approach was adopted in the 2021 EA:

- The Project Scope 1 and 2 GHG emissions estimates were provided by Todoroski Air Sciences (2021) (Attachment A of Appendix S of the Environmental Impact Statement).
- The externality cost of the Project Scope 1 and 2 GHG emissions to NSW was calculated using futures prices for EUAs for the EU ETS, as published by EEX (October 2020) as a central reference price. The overall externality cost of the Project Scope 1 and 2 GHG emissions was adjusted to reflect the potential impact of Project emissions on NSW on the basis of the share of NSW's gross state product (GSP) of the world's gross domestic product (GDP).
- The sensitivity of the externality cost of the Scope 1 and 2 GHG emissions to NSW was considered:
  - the high price forecast referred to the carbon prices derived in the Australian Treasury Clean Energy Future Policy Scenario (CEFS), as published in the NSW Government's 'Draft Greenhouse Gas Emissions Valuation Workbook' (NSW Government 2015b); and
  - the low-price forecast referred to the carbon prices derived from the US EPA Social Cost of Carbon, as also published in the NSW Government's 'Greenhouse Gas Emissions Valuation Workbook'.

The calculated externality cost of the Project GHG emissions to NSW and overall net benefit of the Project under the three pricing scenarios are provided in Table 2-1.

Table 2-1. Project emissions valuation ($2020)

Price Assumption	Externality Cost of Project GHG Emissions to NSW (NPV)	Project Net Benefit to NSW (NPV)
European Union Emissions Trading System	$0.7M	$855M
Australian Treasury Clean Energy Future Policy Scenario	$1.1M	$855M
US EPA Social Cost of Carbon	$0.4M	$856M

3. UPDATED VALUATION OF GHG EMISSIONS

For the updated valuation of GHG emissions, the same general approach as the 2021 EA was adopted with the following revisions:

- adoption of the revised GHG emissions forecast that incorporates revised fugitive emissions estimates (Todoroski, 2022);
- use of updated externality costs of GHG emissions based on more recent estimates; and
- consideration of alternative methods of attributing the externality cost of GHG emissions of the Project to NSW.

3.1. UPDATED GHG EMISSIONS FORECAST

Based on the revised GHG emissions forecast (Todoroski, 2022), the Project (including decommissioning activities) is predicted to give rise to around 16.3 million tonnes of carbon dioxide equivalent (Mt CO_{2e}) in Scope 1 and 2 GHG emissions between 2023 and 2053, compared to the estimate in the 2021 EA of 13.7 Mt CO2-e.

3.2. UPDATED EXTERNALITY COSTS OF GHG EMISSIONS

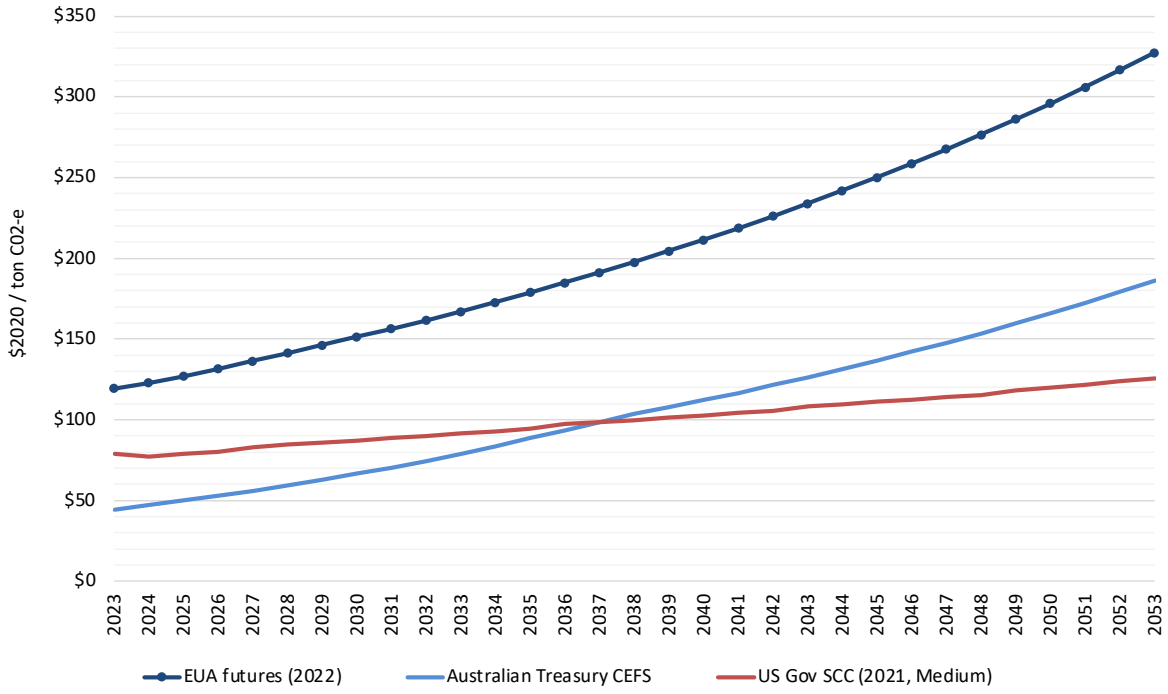
The following updated pricing for estimating externality costs of GHG emissions were adopted:

- The futures prices for EUAs for the EU ETS, as published by EEX at the end of April 2022, which are at around $119 / t CO_{2e} in 2023, and are assumed to reach around $327/t CO2-e in 2053.[1]
- The carbon prices derived in the Australian Treasury CEFS, as published in the NSW Government's 'Draft Greenhouse Gas Emissions Valuation Workbook' (NSW Government 2015b), which is assumed to be around $44/t CO2-e in 2023, reaching around $186/t CO2-e in 2053; and
- The most recent estimates of the social cost of carbon (SCC) published by the US Government (2021) prepared by the 'Interagency Working Group on Social Cost of Greenhouse Gases' ('medium' scenario), which is assumed to be around $79/t CO2-e in 2023, increasing to $126/t CO2-e in 2053.

The updated externality costs of GHG emissions that were adopted are shown in Figure 3-1.

[1] https://www.eex.com/en/market-data/environmental-markets/derivatives-market; EEX EUA futures prices as of 29 April 2022.

Figure 3-1. Updated externality cost of GHG emission estimates (2022, $2020)



Notes: EUA futures prices are only available through to December 2028 (for the 2021 EA) and December 2030 (for the 2022 Update). We have therefore assumed that EUA futures prices would continue to grow in line with historic trends; i.e., at an annual rate of 2.0 per cent for the 2021 EA and at an annual rate of 3.4 per cent for the 2022 Update. The €/AUD exchange rate was assumed to be 1.5, compared to 1.6 for the 2021 EA. The US Government's SCC estimates are only available through to 2050, and we have similarly assumed ongoing trend growth through to 2053. US SCC estimates refer to the 3 per cent average discount rate scenario. The AU$/US$ exchange rate was assumed to be the same as the 2021 EA; i.e., Wood Mackenzie forecast. Australian Treasury CEFS prices are available over the Project forecasting horizon and have been adjusted for inflation using the ABS consumer price index (6401.0).

Source: NSW Government, 2015b; US Government, 2021; EEX, 2022.

The EUA futures prices as of March 2022 have risen significantly compared to the EUA futures prices that were used to value GHG emissions in the 2021 EA. The rise in EUA futures prices reflects two key factors:[2]

- A shortage of natural gas in Europe due to a reduction in Russian gas supplies, which has led power generators to shift to (more emissions-intensive) coal. The greater use of coal has, in turn, boosted the demand for EUAs.

[2] https://www.reuters.com/business/energy/europes-carbon-price-nears-100-euro-milestone-2022-02-04/; https://internationalbanker.com/brokerage/why-prices-of-eu-carbon-permits-are-at-record-highs/; accessed on 10 April 2022.

- The proposed 'Fit for 55' political reforms made by the European Commission to encourage a more rapid move towards Europe's climate targets, including by expanding the scope and sectoral coverage of the EU ETS, reducing the number of free permits given to certain industries, and decreasing the number of permits in circulation at a faster rate. The anticipated reduction in the supply of EUAs has placed upward pressure on EUA futures prices.

Whether or not high EUA prices will persist – and whether therefore the prices of EUA futures represent a reliable estimate of future EUA prices – is unclear. Given current geopolitical tensions, gas supplies in Europe may remain constrained in the foreseeable future. At the same time, the proposed Fit for 55 reforms will only become law after negotiations with EU member states are concluded. EU member states are currently experiencing strong inflationary pressures, including because of high energy price inflation. Given these changed economic and geopolitical conditions, EU member states may not support the changed design parameters of the EU ETS, which have played an important role in generating high EUA futures prices.

The updated incremental global externality cost of Project GHG emissions (i.e. before attributing to NSW) is provided in Table 3-1.

Table 3-1. Updated incremental global externality cost of GHG emissions (2022, $2020)

Price Assumption	Total Externality Cost of GHG Emissions (NPV)
European Union Emissions Trading System (2022)	$857M
Australian Treasury Clean Energy Future Policy Scenario	$431M
US EPA Social Cost of Carbon (2021)	$438M

3.3. ALTERNATIVE METHODS OF ATTRIBUTING THE GHG EMISSION EXTERNALITY COST TO NSW

Table 3-2 shows the resulting estimates and the implications for the net benefit of the Project for NSW in net present value (NPV) terms. Table 3-2 provides estimates of the externality cost of Project Scope 1 and 2 GHG emissions to NSW based on the following alternative approaches:

- NSW's share of global GDP has been used to attribute a share of the incremental global externality cost of GHG emissions from the Project to NSW (the approach used in the 2021 EA); and
- NSW's share of Australia's population has been used to attribute a share of the incremental global externality cost of GHG emissions from the Project to NSW.

In the recent period that has seen a significant growth in EUA futures prices (Section 3.2), it is notable that there has also been a significant increase in the market value (price) of coal. For example, the Newcastle thermal coal benchmark price has more than doubled from around USD150 per tonne in January 2022 to more than USD350 at the beginning of May in 2022.[3] In contrast, the Wood Mackenzie coal price projections that were applied in the 2021 EA assumed that product coal prices would increase to around USD68 per tonne in 2022, gradually increase to a maximum of around USD85 in 2029, and decline thereafter. For the purposes of maintaining a conversative approach, no adjustment has been made to the 2021 EA coal price assumptions for the Project in the net benefit estimates in Table 3-2.

The net benefit of the Project for NSW (Table 3-2) has been calculated adopting the same AU$/US$ exchange rate assumptions adopted in the 2021 EA for consistency (i.e. AU$/US$ exchange rate projected by Wood Mackenzie to gradually increase from 0.64 in 2020 to 0.71 in 2024, remaining at 0.71 thereafter). The 2021 EA AU$/US$ exchange rate forecast is considered to remain appropriate as it is generally consistent with current AU$/US$ exchange rate.

[3] https://tradingeconomics.com/commodity/coal; accessed 7 May 2022.

Table 3-2. Updated incremental externality cost of Project GHG emissions and Project net benefits to NSW (2022, $2020)

	Emissions	Emissions Valuation and Project Net Benefits to NSW		
NSW's Share of Global GDP				
	Scope 1 & 2 emissions (Mt CO2-e)	EUAs (2022) (NPV $2020 m)	Australian Treasury CEFS (NPV $2020 m)	US Gov SCC (2021, Medium) (NPV $2020 m)
Project	0.05	$3.1	$1.5	$1.7
Mount Pleasant Operation	0.01	$0.5	$0.2	$0.3
Difference	0.05	$2.6	$1.3	$1.4
Project net benefits to NSW	**N/a**	**$853**	**$855**	**$855**
NSW's Share of Australian Population				
	Scope 1 & 2 emissions (Mt CO2-e)	EUAs (2022) (NPV $2020 m)	Australian Treasury CEFS (NPV $2020 m)	US Gov SCC (2021, Medium) (NPV $2020 m)
Project	5.3	$331	$161	$175
Mount Pleasant Operation	0.6	$51	$20	$32
Difference	4.8	$280	$140	$143
Project net benefits to NSW	**N/a**	**$577**	**$716**	**$713**

Notes: The Australian share of world GDP as of 2021 was 0.95 per cent, and NSW's GSP share of Australian GDP was 32.6 per cent. NSW's share of Australian population as of 2021 was 31.9 per cent. Totals may not sum precisely due to rounding.

Sources: Todoroski, 2022; World Bank, 2021; https://www.eex.com/en/market-data/environmental-markets/derivatives-market, accessed on 4 May 2022; ABS, 2022; 5220.0 Australian National Accounts: National Income, Expenditure and Product; Table 1 & Table 26; ABS 3101.0 - Australian Demographic Statistics, June 2019.

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