APPENDIX 14

Greenhouse Gas and Energy Assessment

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Delta coal

GREENHOUSE GAS AND ENERGY ASSESSMENT

Chain Valley Colliery Consolidation Project

DRAFT

July 2022

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DRAFT

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Executive Summary

The Chain Valley Colliery Consolidation Project (the Project) provides for the consolidation of the existing operations at Chain Valley Colliery (CVC) and Mannering Colliery (MC) under a single development consent. The key objectives of the Project include:

- Consolidation of the existing CVC and MC consents to streamline regulatory requirements for both Delta Coal and government regulators.
- Alignment of the Delta Coal approved extraction and production rate to the requirements of the VPPS.
- Provide flexibility of operations through the continued concurrent operation of both the CVC and MC Pit Tops.

The Project extends the life of mine (LOM) by 2 years to 2029. While the extension of the life of mine under proposed maximum production rates would allow the recovery of an additional approximately 5.6 million tonnes (Mt) of run-of-mine (ROM) Coal, the change in proposed production rates over the remaining life of the Consolidation Project is projected to result in an additional approximately 9.5 Mt of ROM coal being mined at the combined CVC and MC operations. Over the 2023-2029 period, projected production under the Project is estimated to be approximately 13.4 Mt ROM Coal, however under the current approvals, up to 16 Mt ROM coal could be extracted over the period 2023 – 2027. All coal mined at CVC and MC is planned to be provided to Delta Electricity's Vales Point Power Station which is located adjacent to the CVC and MC operations. Up to 660,000 tonnes/pa of coal from CVC is currently approved to be sold for export via the Port of Newcastle. The ability to sell up to 660,000 tpa into the export market will be retained under the Consolidation Project.

The scope of this greenhouse gas and energy use assessment (GHGEA) includes assessing the likely greenhouse gas emissions of the Project, as required by the SEARs. The GHGEA has assessed both total predicted emissions from the Project over the period 2023-2029 as well as incremental emissions relative to current life-of-mine planning under the existing approvals. The Assessment found that the Project can potentially be associated with the following greenhouse gas emissions (assuming worst case operating exporting scenario).

Potential Greenhouse Gas Emissions associated with the Project – Export Scenario 2023-2029			
	GHG Emissions (t CO_2-e)		% of emissions
	Total	Additional	(Additional)
Scope 1	4,938,154	1,971,372	7.7
Scope 2	313,536	221,637	0.9
Scope 3	33,335,340	23,486,480	91.5
TOTAL	**38,587,031**	**25,350,157**	**100**

It is noted that the above estimates reflect expected emissions based on projected mining rates. As noted above, under the existing consents, CVC and MC combined could lawfully produce up to 16Mt ROM over the existing life of consents (2023-2027) at the currently approved 3.2 Mtpa maximum production rate. As the projected production under the Project is only approximately 13.4 Mt ROM (and up to 19.6 Mt if operated at the full 2.8 Mtpa production rate), the assessed incremental greenhouse gas emissions are

considered to be conservative relative to a comparison of maximum production rates under the Existing Consents and Project.

The Project is forecast to produce an additional approximately 1,970,000 t CO_2-e Scope 1 emissions relative to operations currently contemplated under the existing approved consents. A total of approximately 4,940,000 t CO2-e Scope 1 emissions are predicted over the period 2023-2029 from the Project. Ongoing fugitive emissions associated with legacy mining operations would be expected after this date until all relevant shafts have been backfilled and closed. The majority of Scope 1 emissions are generated by fugitive emissions (predominately associated with fugitive emissions from historical workings) and diesel combustion. Ongoing fugitive emissions associated with legacy mining operations would be expected after this date until all relevant shafts have been backfilled and closed. Delta Coal has a direct influence over Scope 1 emissions generated from fugitive emissions and diesel use, and these emissions will be subject to operational management and mitigation plans.

The Project is forecast to consume approximately 1,400,000 GJ of electricity over the period 2023-2029 (an additional approximately 990,000 GJ relative to Approved), which will generate approximately 316,000 t CO_2-e (221,637 t CO_2-e relative to Approved) of Scope 2 emissions. Delta Coal can influence reductions in Scope 2 emissions by driving electricity reduction and efficiency initiatives.

The Project's forecast energy use intensity is considered to fall below the normal range when compared with other underground coal mining operations across Australia. The Project is expected to be very energy efficient, as the high quality ROM coal only requires a simple processing stage, and produces very low rates of waste material.

Approximately 33,335,340 t CO_2-e (23,486,480 t CO_2-e additional relative to Approved) of Scope 3 emissions are estimated to be associated with the Project. Scope 3 emissions are slightly lower (32,759,010 t CO_2e (23,157,149 t CO_2e additional relative to Approved)) under the most likely operating scenario where all ROM coal is supplied directly to VPPS. The majority of Scope 3 emissions associated with the Project will be generated by third parties who transport and consume coal products. As product coal is proposed to be consumed by the adjacent VPPS, the entirety of Scope 3 emissions under this domestic supply scenario will be subject to domestic controls regarding emissions. It is noted that the scope 3 emissions would occur irrespective of whether the Project proceeds based on the planned operating life of the VPPS to the end of 2029.

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1.0 Introduction

Chain Valley Colliery (CVC) and Mannering Colliery (MC) are underground coal mines located on the southern shore of Lake Macquarie, NSW. The CVC and MC operations are owned and operated by Great Southern Energy Pty Ltd (trading as Delta Coal). In April 2019, Delta Coal acquired Lake Coal's CVC and MC assets. Existing operations are undertaken in accordance with CVC's Development Consent SSD-5465 (as modified), and MC's Major Project Approval MP 06_0311 (as modified), both issued under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

Sunset Power International Pty Ltd, trading as Delta Electricity (DE), own and operate the VPPS located at Mannering Park on the southern extent of Lake Macquarie adjacent to the CVC and MC Pit Top facilities. VPPS is a coal fired power station which commenced operations in the 1960s and has historically been supplied with coal from local and regional coal mines including CVC and MC. Coal is transported to the VPPS via rail, road or overland conveyor. CVC and MC have provided important fuel resources for the adjacent Vales Point Power Station (VPPS) since the early 1960's.

The CVC and MC Pit Top facilities are both located at Mannering Park with approved mining areas within both the Lake Macquarie and Central Coast LGAs. Delta Coal operates CVC and MC as an integrated operation with access to the underground mining areas by employees from both pit tops.

CVC has previously extracted coal from the Wallarah, Great Northern and Fassifern seams while MC has included extraction within both the Great Northern and the Fassifern seams. Both operations are currently approved to carry out mining operations to 31 December 2027.

The owners of both Delta Coal and Delta Electricity are seeking to maximise the use of the Delta Coal assets to supply coal to the VPPS.

The key objectives of the Project include:

- Consolidation of the existing CVC and MC consents to streamline regulatory requirements for both Delta Coal and government regulators.
- Alignment of the Delta Coal approved extraction and production rate to the requirements of the VPPS.
- Provide flexibility of operations through the continued concurrent operation of both the CVC and MC Pit Tops.

While the extension of the life of mine under proposed maximum production rates would allow the recovery of an additional approximately 5.6 million tonnes (Mt) of run-of-mine (ROM) Coal, the change in proposed production rates over the remaining life of the Consolidation Project is projected to result in an additional approximately 9.5 Mt of ROM coal being mined at the combined CVC and MC operations. Over the 2023-2029 period, projected production under the Project is estimated to be approximately 13.4 Mt ROM Coal. Under the current approvals, up to 16 Mt ROM coal could be extracted over the period 2023-2027 however Life of Mine. Up to 660,000 tonnes/pa of coal from CVC is currently approved to be sold for export via the Kooragang Coal terminal. The ability to sell up to 660,000 tpa into the export market will be retained under the Consolidation Project however all coal mined at CVC and MC is planned to be provided to Delta Electricity's Vales Point Power Station which is located adjacent to the CVC and MC operations.

Table 1.1 includes the key features of the Project that will impact greenhouse gas emissions.

Table 1.1 Key features of the Project that may impact Greenhouse Gas Emissions

Stage	Key components of the Project
Operation	• Increasing the life of mine by 2 years • Increasing ROM Coal recovered by up to approximately 9.5 Mt

2.0 Assessment Framework

2.1 Objectives

The Project is State significant development (SSD) as defined under *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP) and will require development consent under Part 4 of the EP&A Act. The development application must include an Environmental Impact Statement (EIS), which complies with the *Environmental Planning and Assessment Regulation 2000* and the Planning Secretary's Environmental Assessment Requirements (SEARs).

The SEARs require 'an assessment of the likely greenhouse gas impacts of the development".

2.2 Scope

The scope of the GHGEA is limited to:

- calculating Scope 1, 2 and 3 greenhouse gas emissions for the Project
- calculating energy use for the Project.

2.3 Definitions

Table 2.1 contains concepts and a glossary of terms relevant to this GHGEA.

Table 2.1 Glossary of Terms[1]

Concept	Definition
Greenhouse gases	The greenhouse gases referred to in this GHGEA include: • Carbon dioxide • Methane • Nitrous oxide • Hydrofluorocarbons • Perfluorocarbons • Sulphur hexafluoride.
Scope 1 emissions	Direct emissions that occur from sources that are owned or controlled by the Proponent (e.g. fuel use). Scope 1 emissions are emissions over which the Proponent has a high level of control.
Scope 2 emissions	Emissions from the generation of purchased electricity consumed by the Project.
Scope 3 emissions	Indirect emissions that are a consequence of the activities of the Project, but occur at sources owned or controlled by other entities (e.g. outsourced services). Scope 3 emissions can include emissions generated upstream of the Project by providers of energy, materials and transport.

[1] The GHG Protocol 2004

2.4 Emission Assessment Methodology

The GHGEA framework is based on the methodologies and emission factors contained in the National Greenhouse Accounts (NGA) Factors 2020 (DISER 2020) (the NGA Factors). The assessment framework also incorporates the principles of The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (WRI/WBCSD 2004) (the GHG Protocol).

The GHG Protocol provides an internationally accepted approach to greenhouse gas accounting. The GHG Protocol provides guidance on setting reporting boundaries, defining emission sources and dealing with issues such as data quality and materiality.

Scope 1 and 2 emissions were calculated based on the methodologies and emission factors contained in the NGA Factors 2020 (DISER 2020) and NGA Factors 2021 (DISER 2021). Consistent with the National Inventory Report, ventilation fugitive emissions were forecast using an implied emissions factor, which was derived from site specific National Greenhouse and Energy Reporting data. Due to the ongoing emissions from old workings which form part of the CVC and MC operations, the estimates of Scope 1 emissions have taken into consideration these annual legacy emissions and future emissions from ROM coal extracted. The estimates of emissions associated with ROM coal extraction also utilise site specific gas content data for the target seam. Scope 3 emissions associated with product transport were calculated based on emission factors contained in the *National GHG Inventory: Analysis of Recent Trends and GHG Indicators* (AGO 2007). The emissions calculations include an estimate of total emissions over the life of operations under the consolidated consent (assumed to be 2023 to 2029) as well as incremental emissions relative to the current mining schedule for approved operations.

It should be noted that the calculations for incremental/additional emissions relative to approved do not take into account the maximum approved production rates under the existing consents and, in this regard, are considered to be conservative relative to emissions which could occur under a maximum operating scenario.

While ROM coal production from the Project is intended for use solely by VPPS, the potential for up to 660,000 tpa of coal to also be exported will be retained. The GHGEA therefore includes consideration of both operating scenarios however it is noted that the Export scenario will only impact Scope 3 emissions through additional emissions associated with transport of coal.

All methodologies and calculations have been made assuming that all operations will continue as described in **Section 1.0**.

2.5 Data Sources

The calculations in this report are based on activity data developed by the Proponent. **Table 2.2**contains the source of activity data.

Table 2.2 Source of activity data used for the assessment

Activity data	Source
Coal production	Delta Coal
On-site fuel consumption	Delta Coal
Electricity consumption	Delta Coal
Fugitive emissions	Delta Coal

A detailed description of activity data and calculations are provided in **Appendix A (Domestic Scenario)** and **Appendix B (Export Scenario)**.

2.6 Assessment Boundary

The GHGEA boundary was developed to include all significant Scope 1, 2 and 3 emissions. **Figure 2.1** demonstrates how the assessment boundary interacts with the potential emission sources under the Proponent's operational control and other emission sources associated with the Project.

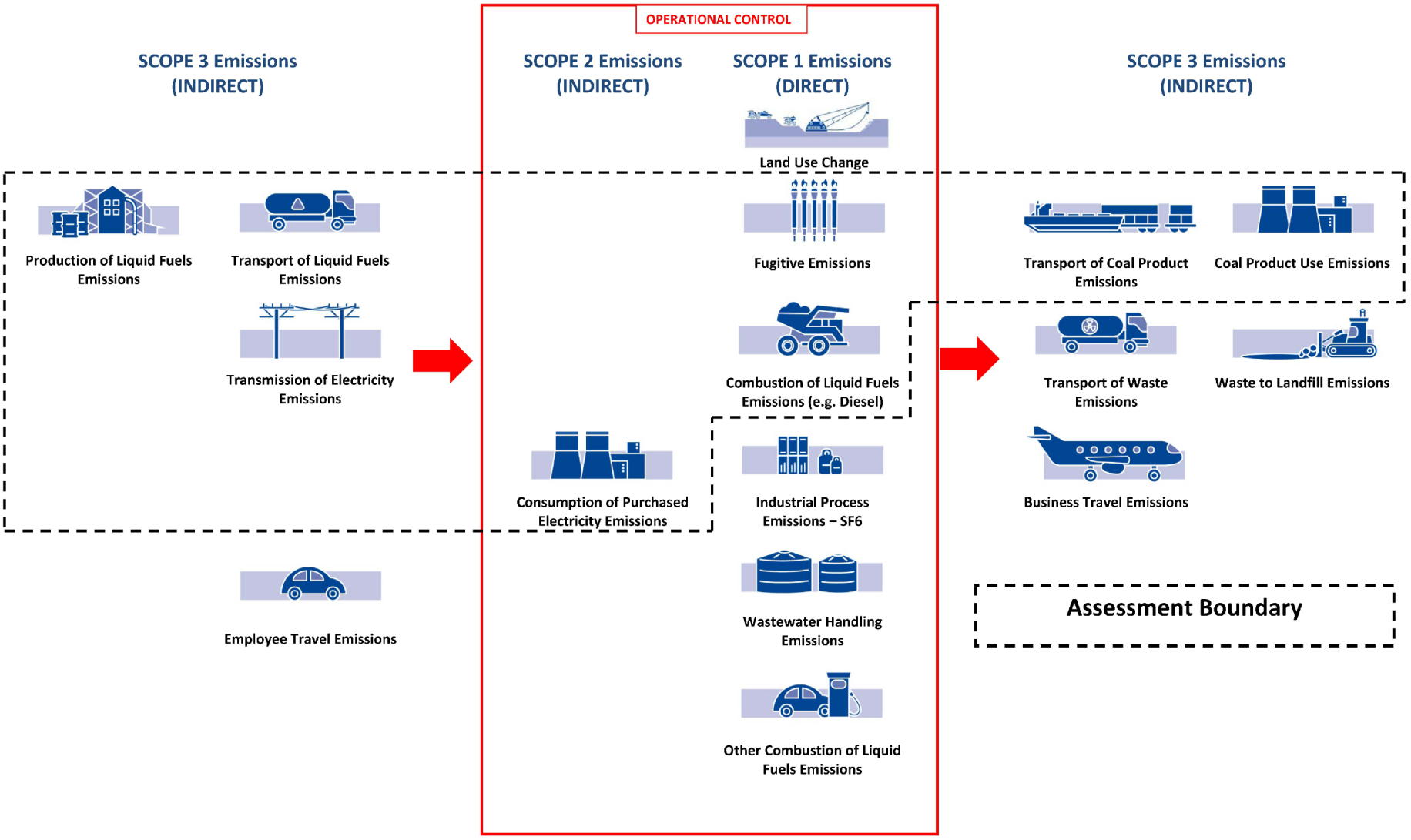


FIGURE 2.1

Greenhouse Gas Assessment Boundary

2.7 Data Exclusions

The GHG Protocol requires inventory data and methodologies to be relevant, consistent, complete, transparent and accurate. The relevance principle states that the greenhouse gas inventory should appropriately reflect greenhouse gas emissions and serve the decision-making needs of users – both internal and external [to the Project] (WRI/WBCSD 2004).

The Project has a number of potential emission sources, however, the key emission sources often targeted by mitigation measures and stakeholders can be summarised as:

- fugitive emissions
- diesel use
- electricity use
- product transport
- product use.

The completeness principle states that all relevant emission sources within the chosen inventory boundary need to be accounted for so that a comprehensive and meaningful inventory is compiled (WRI/WBCSD 2004).

The emission sources listed in Table 2.3 have been excluded from the GHGEA as modelling activity data for these sources is unlikely to generate sufficient emissions to influence the decision making outcomes of stakeholders or the emissions would otherwise be generated from other sources not associated with the Project if the Project did not proceed (e.g. employee transport emissions, sewerage emissions and emissions associated with transport of coal to other domestic sources).

Table 2.3 Data Exclusions

Emission source	Scope	Description
Combustion of fuel for energy	Scope 1	Small quantities of fuels such as petrol and LPG
Industrial processes	Scope 1	Sulphur hexafluoride (high voltage switch gear). Hydrofluorocarbon (commercial and industrial refrigeration)
Waste water handling (industrial)	Scope 1/3	Methane emissions from wastewater management
Solid waste	Scope 3	Solid waste to landfill
Business travel	Scope 3	Employees travelling for business purposes
Employee travel	Scope 3	Employees travelling between their place of residence and Delta Coal

Greenhouse gas emissions resulting from land use, land use change and forestry (LULUCF) were also excluded from the GHGEA. While it is acknowledged that emissions resulting from LULUCF may be an important emission source for decision makers, the Project is not likely to generate land use change and does not involve any additional vegetation disturbance.

2.8 Coal Handling

Delta Coal currently transfers coal from active mining areas to the VPPS via the MC pit top and an overland conveyor. Delta Coal has approval to transfer 2.1 Mtpa of coal from CVC to the MC pit top via an underground conveyor which is then transferred from the MC pit top to the VPPS via an overland conveyor. Delta Coal also has approval to handle up to 1.5 Mt of coal at the CVC pit top facilities. This coal is approved to be hauled to VPPS via truck and up to 660,000 tpa of product coal is approved to be hauled to the Port of Newcastle by road and up to 180,000 tpa is approved to be hauled by road to other domestic customers. The Project provides for greater coal handling flexibility, and allows Delta Coal to truck up to 1.5 Mtpa of coal between the CVC pit top and the VPPS via internal roads and sections of privately owned construction road and/or transfer up to 2.8 Mtpa coal from the MC pit top to the VPPS via the existing overland conveyor within an overall complex cap of 2.8 Mtpa.

The Project retains the existing multiple means of transferring coal to the VPPS, however with increased throughput available at MC to cover all of the approved operations. The Project it is not expected to increase energy use intensity as the Project results in an overall reduction from the currently approved capacity of 3.2 Mtpa. Consistent with currently approved operations, product coal will either be transferred via the existing conveyor system from MC or via truck from CVC with trucking being the more energy intensive of the two methods. The use of MC only to transfer product coal to VPPS with no domestic or export product movement is the most likely to the operational scenario. The proposed increase to the MC throughput to enable this to occur provides an opportunity to reduce energy requirements relative to the existing approved transport options.

Conservatively, this assessment assumes the greenhouse gas impacts and the energy use intensity of coal transfer will remain similar to existing operations and the assessment has elected to model the Project's coal transfer emissions using historical energy use data. Forecasting Project emissions based on historical energy use intensity ensures the assessment generates conservative results and is based on site specific data.

2.9 Materiality

The GHG Protocol states "information is considered to be material if, by its inclusion or exclusion, it can be seen to influence any decisions or actions". This assessment assumes data, results and impacts can be significant and influence decision makers, while also being numerically immaterial (i.e. less than 5%).

3.0 Emission and Energy Assessment Results

Greenhouse gas and energy use estimates have been calculated for the Project. The greenhouse gas estimates referenced in this document only relate to the Project. Estimates in this document do not include emissions associated with currently approved operations however annual emissions from the continuation of approved operations could expect to be similar to the predicted annual emissions from the extended life of operations.

The Project is assessed at its upper approval limits. The assessment aims to identify the potential greenhouse gas emissions associated with the Project. The assessment is not supposed to represent actual annual activity.

3.1 Operational Emissions – Planned Scenario

The Project has been designed to supply coal to the VPPS, however, the Project includes transport conditions which allow Delta Coal to truck coal to other domestic power stations, and export coal from Newcastle Port. This section assesses the Project's potential greenhouse gas emissions, assuming Delta Coal elects to supply all product to the VPPS (Planned Scenario). An Export Scenario is considered in **Section 3.2**.

The following information was used to estimate the greenhouse gas emissions associated with the Planned Scenario.

- approximately 13.4 Mt of ROM Coal will be extracted over the extended life of mine with additional ROM coal production relative to current production estimates under Approved operations being approximately 9.5 Mt ROM coal
- operational diesel use (e.g. underground mining equipment) will average 0.44 litres/ROM coal tonne
- electricity use will average 29 kWh/ROM coal tonne
- fugitive emissions:
    - legacy emissions from past mining of 515,348 t CO_2-e/ year)
    - fugitive emissions from ROM mined 0.097 t CO_2-e/ROM coal tonne (including post mining emissions)
- product coal can be classified as Bituminous coal to align with the NGA Factors
- 100% of all product coal will be transferred to VPPS via conveyor
- the VPPS conveyor is owned and operated by Delta Electricity.

The total greenhouse gas emissions associated with the Planned Scenario are summarised in **Table 3.1** with additional emissions relative to the Approved operating scenario shown in **Table 3.2.**

Table 3.1 Summary of Greenhouse Gas Emissions for the Planned Scenario (Total)

Stage	Scope	Source	Source Totals (t CO_2-e)	Scope Totals (t CO_2-e)
Operation	Scope 1 (Direct)	Diesel use	15,931	4,938,154
		Fugitive emissions (historical mining)	3,607,439	
		Fugitive Emissions (ROM Coal)	1,314,784	
	Scope 2 (Indirect)	Electricity	313,536	313,536
	Scope 3 (Indirect)	Product use	32,704,831	32,759,010
		Domestic product transport	23,968	
		Export product transport	0	
		Associated with energy extraction and distribution	30,211	
Total operational greenhouse gas emissions associated with the Planned Scenario				**38,010,701**

(Refer to **Appendix A** for further detail)

Table 3.2 Summary of Greenhouse Gas Emissions for the Planned Scenario (Additional)

Stage	Scope	Source	Source Totals (t CO_2-e)	Scope Totals (t CO_2-e)
Operation	Scope 1 (Direct)	Diesel use	11,262	1,971,372
		Fugitive emissions (historical mining)	929,413	
		Fugitive Emissions (ROM Coal)	1,030,697	
	Scope 2 (Indirect)	Electricity	221,637	221,637
	Scope 3 (Indirect)	Product use	23,111,850	23,157,149
		Domestic product transport	16,943	
		Export product transport	0	
		Associated with energy extraction and distribution	21,356	
Additional operational greenhouse gas emissions associated with the Planned Scenario				**25,350,157**

3.1.1 Direct Operational Emissions

The Planned Scenario is forecast to generate an additional approximately 1,970,000 t CO_2-e of Scope 1 emissions relative to existing approved operations. Scope 1 emissions will be generated by the ventilation system releasing coal mine waste gas, handling coal and diesel consumption.

An estimated 1,030,697 t CO_2-e of additional Scope 1 emissions (approximately 52% of Scope 1 emissions) is attributed to the additional 2 years of fugitive emissions from historical workings and is unrelated to ROM production rates.

3.1.2 Indirect Operational Emissions – Planned Scenario

The Planned Scenario can be associated with approximately 314,000 t CO_2-e of Scope 2 emissions of which 222,000 t CO_2-e are estimated as being additional to the current mining schedule for Approved operations. Scope 2 emissions are generated by electricity generators in NSW.

The Planned Scenario can also be associated with approximately 32,760,000 t CO_2-e of Scope 3 emissions of which 23,157,000 t CO_2-e are estimated as being additional to the current mining schedule for Approved operations. Scope 3 emissions are indirect emissions that are associated with the Planned Scenario, but occur at sources owned or controlled by other entities. Scope 3 emissions simply acknowledge that products will continue to generate greenhouse gas emissions as they move through a value chain. The primary source of Scope 3 emissions is product use. It is noted that VPPS is the sole user of product coal from the Project under the Planned Scenario.

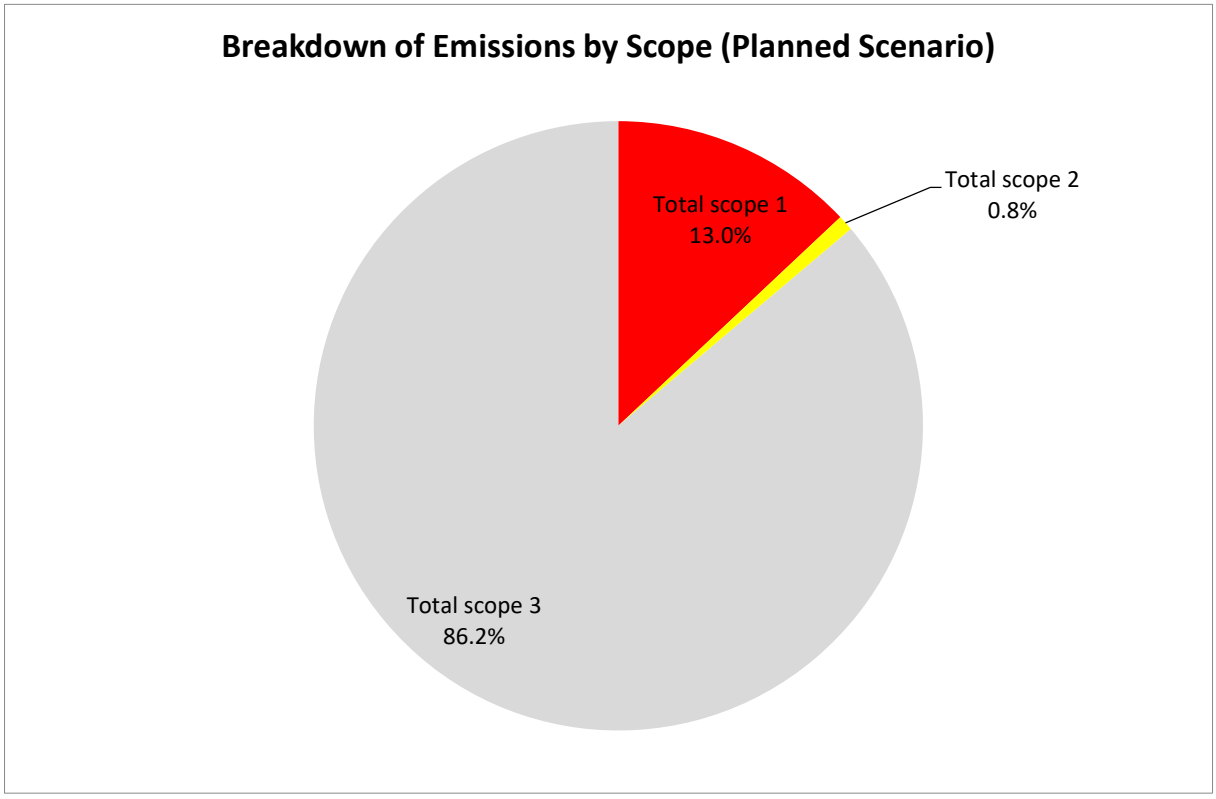


Figure 3.1 Breakdown Of Emissions By Scope (Planned Scenario)

Figure 3.1 demonstrates the Planned Scenario's greenhouse gas inventory is dominated by Scope 3 emissions. Approximately 86.2% of the greenhouse gas emissions associated with the Project (91.3% of additional emissions) are Scope 3 emissions.

Delta Coal is not seeking approval to generate Scope 3 emissions, as they are not generated by the Project. The Planned Scenario aligns production with the current planned (and approved) life of the VPPS and therefore does not result in any increase in overall GHG emissions relative to the Project not proceeding. The assessment of Scope 3 emissions is therefore an attribution of those emissions from the VPPS that relate to coal mined from the Project and does not reflect an absolute increase in global GHG emissions.

3.2 Operational Emissions – Export Scenario

The Project would retain the current approval to truck up to 660,000 tpa to the Newcastle Port, and ship up to 660,000 tpa to export markets. Delta Coal intends to continue to transfer all product to the VPPS, however, it is possible for Delta Coal to export up to 660,000 tpa during 2028 and 2029. The extension of the currently approved product transport conditions provides the potential to generate a new source of greenhouse gas emissions in 2028 and 2029.

This section assesses the Project's potential greenhouse gas emissions, assuming Delta Coal elects to utilise its export market product transport conditions (Export Scenario). The following information was used to estimate the greenhouse gas emissions associated with the Export Scenario.

- approximately 13.4 Mt of ROM Coal will be extracted over the extended life of mine with additional ROM coal production relative to current production estimates under Approved operations being approximately 9.5 Mt ROM coal
- operational diesel use (e.g. underground mining equipment) will average 0.44 litres/ROM coal tonne
- electricity use will average 29 kWh/ROM coal tonne
- fugitive emissions:
    - legacy emissions from past mining of 515,348 t CO_2-e/ year)
    - fugitive emissions from ROM mined 0.098 t CO_2-e/ROM t
- product coal can be classified as Bituminous coal to align with the NGA Factors
- 660,000 tpa of product coal will be trucked to Newcastle Port and exported via ship (2028 and 2029 only)
- all other ROM coal will be transferred to VPPS via conveyor with volumes varying based on projected production rates
- trucking distances will average 140 km return
- trucks are assumed to have a 32t load capacity
- shipping distances will average 9,500 km
- the VPPS conveyor is owned and operated by Delta Electricity (i.e. emissions associated with its operation are Scope 3 emissions).

The total greenhouse gas emissions associated with the Export Scenario are summarised in Table 3.3 with additional emissions associated with the Project summarised in Table 3.4 .

Table 3.3 Summary of Total Operational Greenhouse Gas Emissions for the Export Scenario

Stage	Scope	Source	Source Totals (t CO_2-e)	Scope Totals (t CO_2-e)
Operation	Scope 1 (Direct)	Diesel use	15,931	4,938,154
		Fugitive emissions (historical mining)	3,607,439	
		Fugitive Emissions (ROM Coal)	1,314,784	

Stage	Scope	Source	Source Totals (t CO_2-e)	Scope Totals (t CO_2-e)
	Scope 2 (Indirect)	Electricity	313,536	313,536
	Scope 3 (Indirect)	Product use	32,704,831	33,335,340
		Domestic product transport	15,719	
		Export product transport	0	
		Associated with energy extraction and distribution	584,580	
Total operational greenhouse gas emissions associated with the Export Scenario				**38,587,031**

(Refer to **Appendix B** for further detail)

Table 3.4 Summary of Additional Operational Greenhouse Gas Emissions for the Export Scenario

Stage	Scope	Source	Source Totals (t CO_2-e)	Scope Totals (t CO_2-e)
Operation	Scope 1 (Direct)	Diesel use	11,262	1,971,372
		Fugitive emissions (historical mining)	929,413	
		Fugitive Emissions (ROM Coal)	1,030,697	
	Scope 2 (Indirect)	Electricity	221,637	221,637
	Scope 3 (Indirect)	Product use	23,111,850	23,486,480
		Domestic product transport	12,229	
		Export product transport	334,046	
		Associated with energy extraction and distribution	21,356	
Additional operational greenhouse gas emissions associated with the Export Scenario				**25,679,489**

(Refer to **Appendix B** for further detail)

3.2.1 Direct Operational Emissions

The Project's transport conditions are not expected to change direct operation emissions.

3.2.2 Indirect Operational Emissions – Export Scenario

The Export Scenario can be associated with approximately 314,000 t CO_2-e of Scope 2 emissions of which 222,000 t CO_2-e are estimated as being additional to the current mining schedule for Approved operations. The Scope 2 emissions under the Export Scenario are effectively identical to the Planned Scenario.

The Export Scenario can also be associated with approximately 33,335,340 t CO_2-e of Scope 3 emissions of which 23,486,480t CO_2-e are estimated as being additional to the current mining schedule for Approved operations. Scope 3 emissions are indirect emissions that are associated with the Export Scenario, but occur at sources owned or controlled by other entities. Scope 3 emissions simply acknowledge that

products will continue to generate greenhouse gas emissions as they move through a value chain. The primary source of Scope 3 emissions is product transport and product use.

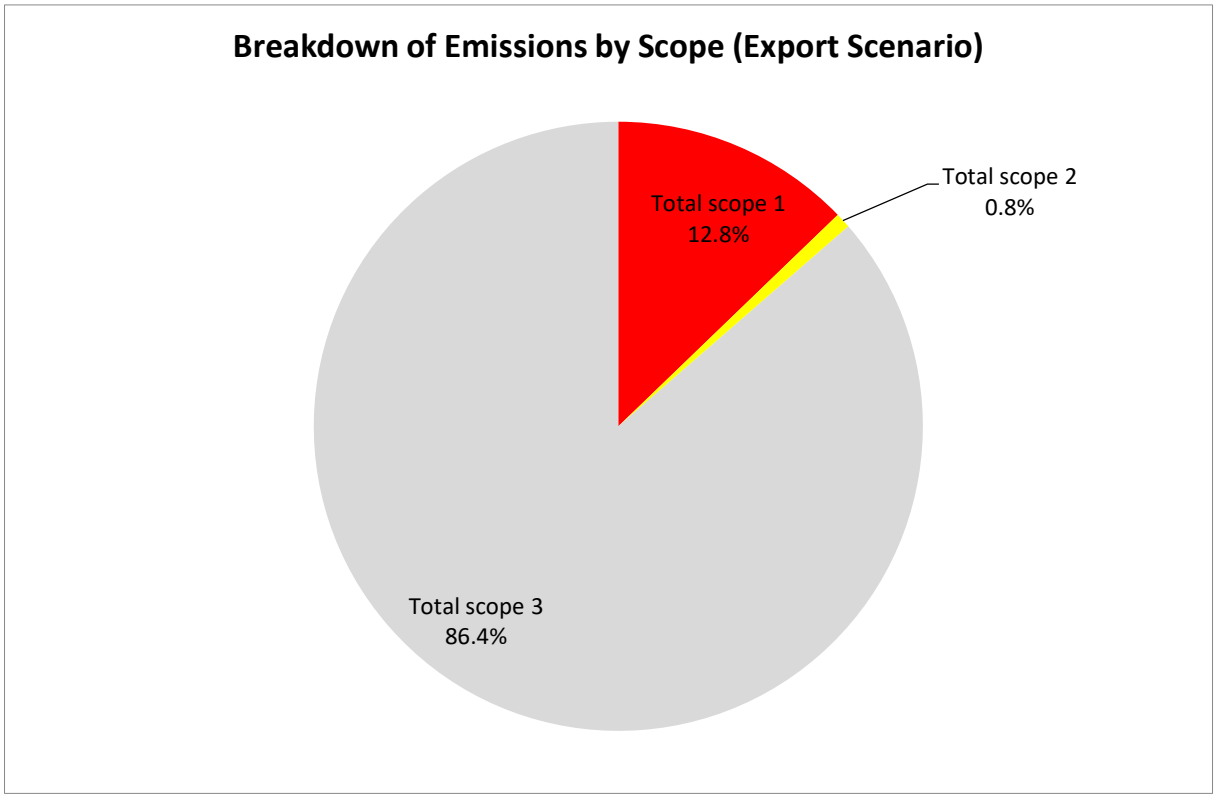


Figure 3.2 Breakdown Of Emissions by Scope (Export Scenario)

Figure 3.2 demonstrates the Export Scenario's greenhouse gas inventory is dominated by Scope 3 emissions. Approximately 86.4% of the greenhouse gas emissions associated with the Export Scenario (91.5% of additional emissions) are Scope 3 emissions.

Delta Coal is not seeking approval to generate Scope 3 emissions, as they are not generated by the Project. Approval for Scope 3 emissions has been, or will be, granted to third parties using other approval pathways.

Overall, the incremental Scope 3 emissions over the life of the Project associated with exporting up to 660,000 tpa of product coal rather than supply it to VPPS is approximately 576,330 tCo_2-e. This represents less than 2% of the Projected total incremental emissions of the no-export scenario which is less than the adopted materiality threshold.

3.3 Energy Use

Both the Planned and Export Scenarios are forecast to require approximately 1,627 GJ of energy from diesel and grid electricity (1,149,874 GJ additional to Approved projected operational conditions). Energy use by underground coal mines in Australia averages between 140 - 490 Mega joules (MJ)/product tonne (Energetics 2009). The forecast energy use intensity associated with the Planned Scenario is approximately 121 MJ/product tonne.

The Project is expected to be very energy efficient, as the high quality ROM coal only requires a simple processing stage, and produces very low rates of waste material. The Project will operate without washing, separation and dewatering processes, which reduces the energy demands of the preparation plant, and the energy demands associated with emplacing tailings and reject materials.

The energy use assumptions used in this assessment are higher than those used for the CVC Modification 4 greenhouse gas assessment (Umwelt 2020). Since 2020, Delta Coal has increased its underground ventilation capacity by approximately 10%. The increase in ventilation load has increased electricity use intensity across Delta Coal's operations.

4.0 Impact Assessment

The greenhouse gas emissions generated by the Project have the potential to impact the physical environment and the emission reduction objectives of State, national and international governing bodies. The following assessment makes the distinction between environmental impacts and impacts on policy objectives.

4.1 Impact on the environment

The primary impact of greenhouse gas emissions is the accumulation of carbon in 'carbon sinks'. Historically, anthropogenic greenhouse gas emissions have accumulated in three major carbon sinks - the ocean (30%), terrestrial plants (30%) and the atmosphere (40%) (BOM and CSIRO 2014).

The accumulation of greenhouse gas in the atmosphere is an important driver of global warming, sea level rise and climate change (IPCC 2013). Sea level rise and climate change may have many ramifications for the natural and built environment. The accumulation of greenhouse gas in the ocean is also an important driver of ocean acidification (IPCC 2013).

4.2 Relative Source of Emissions

The Project has the potential to produce approximately 4,938,154 t CO_2-e Scope 1 emissions over 7 years, and generate up to approximately 792,000 t CO_2-e Scope 1 emissions per annum at maximum production[2].

The NGER and Safeguard Mechanism compliance thresholds maintained by the Clean Energy Regulator can be used to evaluate the relative size of annual greenhouse gas emissions (provided in **Table 4.1**). Facilities which emit over 100,000 t CO_2-e Scope 1 emissions per annum are considered "large" emission sources by the Clean Energy Regulator. Corporate groups emitting over 50,000 t CO_2-e Scope 1 emissions per annum are considered significant emission sources by the Clean Energy Regulator. Similarly, individual facilities emitting over 25,000 t CO_2-e Scope 1 emissions per annum are considered significant emission sources by the Clean Energy Regulator. The Project as a stand-alone entity could be considered as a large emissions source, as it may produce annual Scope 1 emissions of up to 792,000 t CO_2-e. It should also be noted that as of the 2020/2021 financial year, Delta Electricity and Delta Coal are now reported as a combined facility, exceeding the 100,000 threshold.

Table 4.1 Greenhouse Gas Reporting Thresholds Maintained by the Clean Energy Regulator

Annual greenhouse gas thresholds	Scope 1 emissions threshold (t CO_2-e)
NGER individual facility reporting threshold	25,000
NGER corporate reporting threshold	50,000
Safeguard Mechanism threshold	100,000

Based on predicted Scope 1 emissions, the emissions intensity of the Project ranges between 0.29 and 0.43 t CO2-e/ROM t. The emissions intensity of the Project is only partly correlated to ROM production due to the ongoing emissions from historical mining areas which are unrelated to production rates in any year. As a result, lower production rates result in a higher emissions intensity.

[2] 2.8Mt ROM/year. Predicted Scope 1 emissions from 2028 are 788,000 tCO2-e at a production rate of 2.75Mtpa

4.3 Impact on International Policy Objectives

The United Nations Framework Convention on Climate Change (UNFCCC) is the leading international forum for setting climate change targets and objectives. The UNFCCC has been responsible for developing internationally accepted greenhouse gas emission reporting methodologies, and has led the development of:

- the Kyoto Protocol
- the Paris Agreement
- specific directives and guidance to improve the implementation of the UNFCCC.

The Kyoto Protocol became international policy in 2005, and it committed the European Union (EU) plus 37 other member states to manage greenhouse gas emissions between 2008 and 2012. A second round of the Kyoto Protocol (the Doha Amendment) committed the EU plus 191 other member states to manage greenhouse gas emissions between 2013 and 2020. Australia was a signatory to both rounds of the Kyoto Protocol and Australia will meet its obligations under the Kyoto Protocol in 2020 (DoEE 2018).

In 2015 the UNFCCC successfully negotiated an international climate change agreement between 195 countries (the Paris Agreement). The Paris Agreement aims to:

- hold the increase in the global average temperature to well below 2°C above pre-industrial levels, and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels
- aim to reach global peaking of greenhouse gas emissions as soon as possible
- achieve a balance between anthropogenic greenhouse gas emissions and removals (i.e. Net Zero Emissions) in the second half of this century (i.e. between 2050 – 2100)
- pursue goals allowing sustainable development, and recognising the differentiated capabilities of member states – there is some expectation that developed countries will act faster than developing countries.

To limit the global average temperature increase to 1.5°C above pre-industrial levels, the IPCC estimates cumulative anthropogenic emissions from 2018 must not[3] exceed 420,000,000,000 t CO_2 (IPCC 2018). To achieve the aims of the Paris Agreement, the global community aims to accumulate less than 420 Gt of carbon dioxide before global systems stop accumulating greenhouse gas emissions (i.e. reach net zero emissions). The IPCC refers to this cumulative emission ceiling as a "carbon budget", and it represents a finite resource which can be depleted by generating emissions, and replenished by removing emissions. Activities which generate greenhouse gas emissions are currently depleting the carbon budget by approximately 42 Gt CO_2 per annum (IPCC 2018). The incremental Scope 1, Scope 2 and Scope 3 emissions from the Project (i.e. relative to the current Approved Operations production Schedule) under the Export Scenario (25.679 Mt CO_2-e) represent approximately 0.0061% of this post 2018 carbon budget.

The IPCC recognises significant limitations in quantifying an actual carbon budget, however, the concept of limiting cumulative emissions within a set carbon budget resonates with UNFCCC policy makers. The extent to which the Project's emissions may change a carbon budget will largely be driven by the global response to greenhouse gas emissions.

[3] To provide a 66% chance of limiting temperature increase to 1.5°C

4.4 Impact On Australian Policy Objectives

Australia signed the Paris Agreement on 22 April 2016, and Australia's obligations under the Paris Agreement will continue to drive national greenhouse gas policy. Under the Paris Agreement, Australia is obliged to:

- prepare, communicate and maintain a Nationally Determined Contribution (NDC). An NDC outlines the size and type of mitigation contribution each member state will make to the international effort
- pursue domestic mitigation measures, with the aim of achieving the objectives of its NDC
- communicate an NDC every 5 years
- quantify its NDC in accordance with IPCC methodologies, which promote transparency and avoid double counting.

The recently elected Labor Government has promised to increase Australia's commitment under the Paris Agreement to reducing greenhouse gas emissions by 43 %, on 2005 levels, by 2030 (Australia Labor Party, 2022). Scope 1, 2 and 3 emissions associated with the Project are forecast to occur between 2023 and 2029. GHG emissions associated with the Project may contribute towards Australia's future national mitigation task and may shape the mitigation priorities for the 2025-2030 NDC. It is noted however that the emissions associated with the Project are associated with generation from the VPPS which has a planned operating life to 2029. Emissions associated with the supply of coal to the VPPS and its operation will occur irrespective of whether the Project proceeds. The close proximity of the Project to the VPPS and existing coal transport infrastructure means the emissions associated with supply coal to the VPPS from CVC and MC are likely to be lower than supply from other domestic sources which would have increased transport related emissions.

4.5 Impact on NSW Policy Objectives

The NSW Government has structured its greenhouse gas reduction target to align with the Paris Agreement. NSW is planning a 35% reduction in its baseline emissions (measured in 2005) by 2030, and it will then seek to achieve Net Zero Emissions by 2050. The NSW Net Zero Plan is staged across three decades and Stage 1 begins in 2020.

The NSW Net Zero Plan states that mining in NSW will continue to be an important part of the economy, and action on climate change must not undermine mining businesses, jobs and communities. The NSW Net Zero Plan aims to capture and utilise fugitive emissions from coal mining, and ensure that NSW mining companies can take advantage of global action on climate change. The NSW Government plans to invest in a Coal Innovation Program to reduce emissions associated with coal.

Plans for Stage 2 (2030-2040) and Stage 3 (2040-2050) will be developed over the next 20 years and incorporate technology and strategies beyond current planning horizons. Scope 1 and 2 emissions associated with the Project may contribute towards NSW's 2030 mitigation task and closure related emissions and ongoing fugitive emissions (common to both the Project and existing approved operations) may shape the mitigation priorities for the 2030-2040 Net Zero Plan.

Given the Project's direct linkages to the VPPS and the planned cessation of mining operations in 2029, the Project is consistent with the NSW Net Zero Plan.

5.0 Conclusion

The Project has the potential to generate approximately 4,938,154 t CO_2-e of Scope 1 emissions between 2023 and 2029 from combusting diesel and releasing fugitive emissions. This represents a predicted 1,971,372 t CO2-e increase in Scope 1 emissions relative to current mine planning for existing approved operations.

The Project's forecast energy use intensity is considered to fall below the normal range when compared with other underground coal mining operations across Australia. The Project is expected to be very energy efficient for a coal mine.

The Project could potentially be associated with approximately 33,335,340 t CO_2-e of Scope 3 emissions. Delta Coal is not seeking approval to generate Scope 3 emissions.

6.0 References

Australian Greenhouse Office (2007). National Greenhouse Gas Inventory: Analysis of Recent Trends and Greenhouse Gas Indicators

Australian Government Department of Industry, Science, Energy and Resources (DISER) (2021). National Greenhouse Accounts (NGA*)* Factors August 2021

Australian Labor Party (ALP) 2022, *Powering Australia: Labor's plan to create jobs, cut power bills and reduce emissions by boosting renewable energy.* https://www.alp.org.au/policies/powering-australia (Accessed 22 June 2022)

Bureau of Meteorology and CSIRO (2014). State of the climate 2014

Department of the Environment and Energy (DoEE) (2018). Australia's emissions projections 2021. December 2018

Energetics (2009). Ulan West energy efficiency design review.

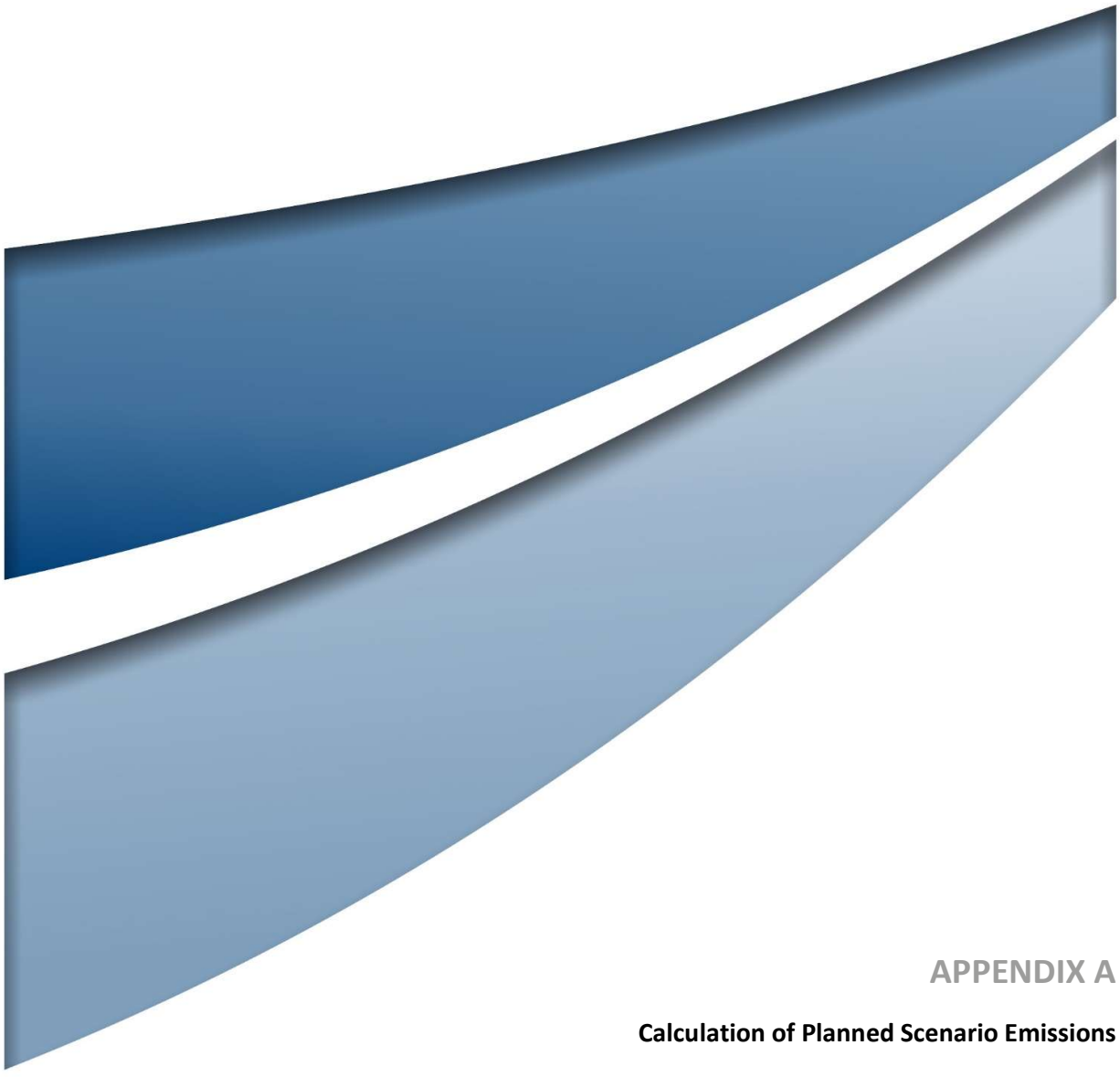
Intergovernmental Panel on Climate Change (IPCC) (2013). Climate Change 2013: Working Group I: The physical science basis

Intergovernmental Panel on Climate Change (IPCC) (2018). Global Warming of 1.5°C. An IPCC Special Report.

National Greenhouse Gas Inventory (2011). National Greenhouse Gas Inventory

State of New South Wales (2020). NSW Net Zero Plan Stage 1: 2020 - 2030

World Resources Institute and the World Business Council for Sustainable Development (WRI/WBCSD) (2004). The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard



APPENDIX A

Calculation of Planned Scenario Emissions

Assumed Production Rates

Scenario	Assumed Production Rate based on mine planning (t ROM coal/ annum)							
	2023	2024	2025	2026	2027	2028	2029	Total
Approved	1,562,287	1,561,468	810,602	0	0	0	0	3,934,357
Project	1,734,287	1,903,933	1,572,019	1,813,780	1,989,631	2,750,000	1,659,333	13,422,983
Additional	172,000	342,465	761,417	1,813,780	1,989,631	2,750,000	1,659,333	9,488,627

Stationary Diesel Use

Activity Data		Energy Use		Emission Factors		
				CO_2	CH_4	N_2O
kL		GJ/kL	GJ	kg CO_2-e/GJ	kg CO_2-e/GJ	kg CO_2-e/GJ
Total	5,879	38.6	226,940	69.9	0.1	0.2
Additional relative to Approved	4,156	38.6	160,422	69.9	0.1	0.2
				t CO_2-e	t CO_2-e	t CO_2-e
Breakdown of individual GHG emissions (t CO_2-e)	Total			15,863	23	45
	Additional				16	32
Stationary Diesel Use GHG Emissions (t CO_2-e)				Total		15,931
				Additional		11,262

Scope 1 Fugitive Emissions Estimate Calculations

- Emissions from ROM Coal Extraction (including Post Mining Emissions from ROM coal once extracted) calculated from coal seam gas content within ROM Coal (emissions per tonne).
- Legacy Fugitive Emissions associated with emissions from previously mined areas (unrelated to ROM extraction rate) calculated from NGERS estimates (2016/17, 2017/18 and 2019/20 and 2020/1[4]) by removing estimated emissions from ROM coal based on Fassifern Gas content.
- ROM Coal Extraction emissions based on Project incremental ROM tonnes relative to 'Approved' operations.
- Legacy Fugitive Emissions based on extended life of operations relative to Existing Consents (2 Years).

[4] 2018-19 NGERS data for operations not available. NGERs estimates adjusted to reflect increase GWP for CH_4 of 28 based on Fassifern Seam gas content percentage

Fassifern Seam Gas Content Calculation Inputs

Gas Component	
Gas Content Fassifern Seam - CVC Mining Area (m^3/t ROM Coal)	5.30
Methane (CH4) percentage of Fassifern Seam Gas	97%
Carbon Dioxide (CO2) percentage of Fassifern Seam Gas	3%
Methane Global Warming Potential factor	28

Fugitive emissions (attributable to ROM– includes post mining emissions) (Scope 1)

Domain	Activity Data	Emission Factors	
		CO_2	CO_2/CH_4
	ROM Coal Tonne	t CO_2-e/ ROM t	
Project	13,422,983	0.098	
Additional	9,488,627	0.098	
Fugitive Emissions attributable to ROM	Project	1,314,784	
	Additional	929,413	

Fugitive emissions (Legacy from old Operations) (Scope 1)

Combined NGER data CVC and Mannering	Fugitive Emissions (NGERS[5])	Revised Fugitive Emissions Estimate[6]	ROM Production	Historical Fugitive Emissions from ROM	Legacy fugitive emissions[7]
Year	t CO_2-e	t CO_2-e	ROM (t)	t CO_2-e [8]	t CO_2-e
FY2016/2017	517,552.18	577,795.25	1,378,996.00	120,645	442,722
FY2017/2018	715,012.42	798,239.87	758,110.00	66,325	723,983
FY2019/2020	582,861.20	650,706.24	1,120,973.39	98,071	540,907
FY 2021/2022	499,706.60	499,706.60	1,489,783.14	145,925	353,782
Average Annual Legacy Fugitive Emissions					515,348
Legacy Emissions associated with 2 year extension of LOM (t CO_2-e)					1,030,697

[5] As calculated for NGERS Reporting. Methane contribution based on GWP of 25 except 2020/21 which applies GWP of 28.
[6] Methane GWP of 28, calculated based on Fassifern Seam gas concentrations
[7] Based on Revised Fugitive Estimate
[8] Calculated from Fassifern Seam Gas Content Data: 5.30 m^3/tonne, 97% CH_4, 3% CO_2

Electricity Use (Scope 2)

Calculated Site Electricity Use (GJ/ROM tonne) of 0.104 from 2017-20 electricity use and ROM coal production rates

Component	Activity Data		Emission Factors
	ROM Coal Tonne	Calculated Energy Use (GJ)	kg CO_2-e/GJ
Project	13,422,983	1,399,717	224
Additional	9,488,627	989,451	
GHG Emissions – Energy Use	Project		313,536
	Additional		221,637

Product use (Scope 3) – Bituminous Coal

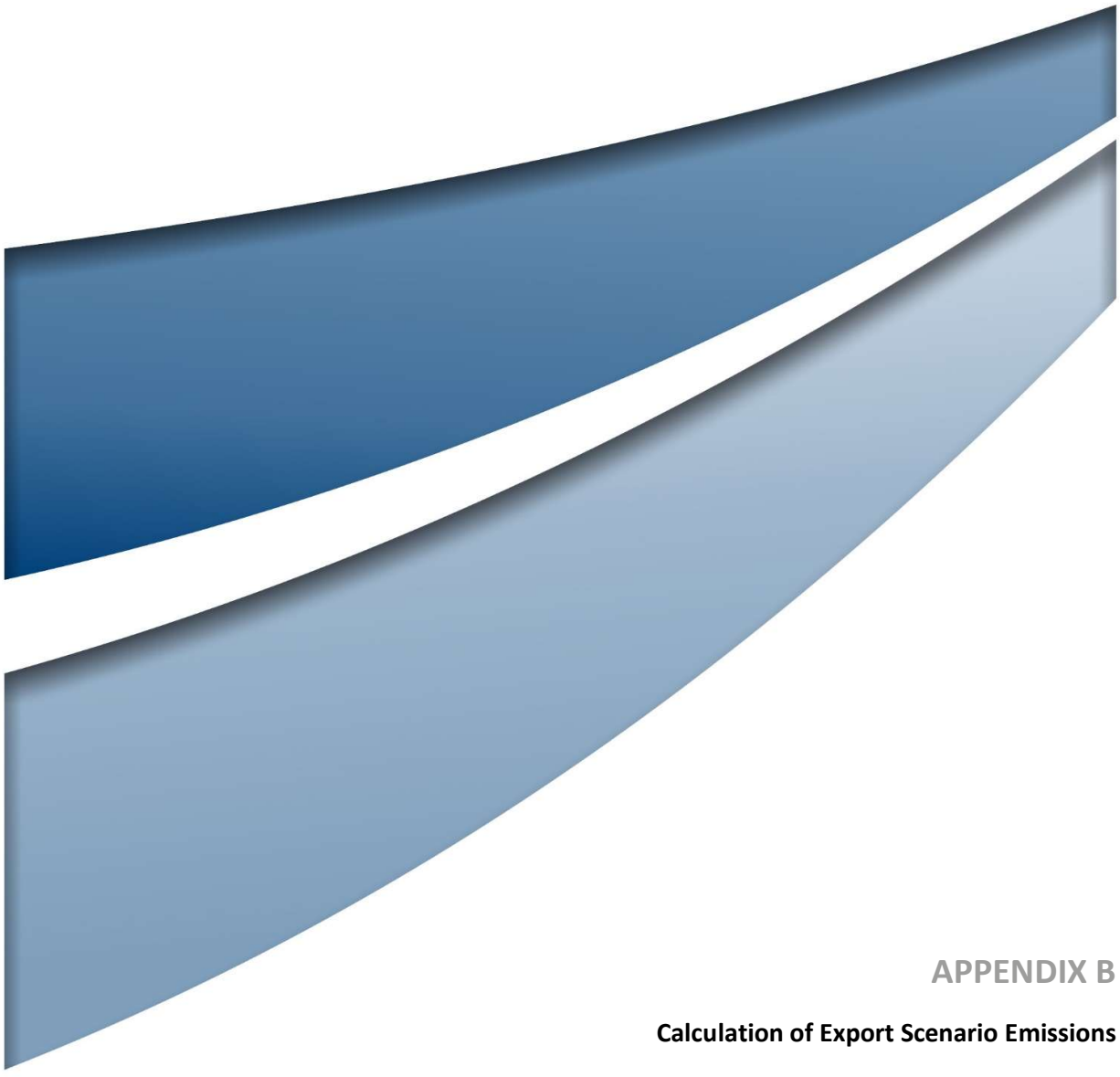
Activity Data		Energy Production		Emission Factors		
				CO_2	CH_4	N_20
Component	Product (t)	GJ/Product t	GJ	kg CO_2-e/GJ	kg CO_2-e/GJ	kg CO_2-e/GJ
Project	13,422,983	27.0	362,420,554	90	0.04	0.2
Additional	9,488,627		256,192,926			
Total GHG Emissions (t CO_2-e)				Project		32,704,831
				Additional		23,118,850

Extraction, Production and Distribution of Energy Purchased (Scope 3)

Activity Data			Emission Factors		
			CO_2	CH_4	N_20
Purchased energy		GJ	kg CO_2-e/GJ	kg CO_2-e/GJ	kg CO_2-e/GJ
Diesel	Project	226,940	3.6	N/A	N/A
	Additional				
Electricity	Project	1,399,717	24	N/A	N/A
	Additional				
Total GHG Emissions (t CO_2-e)			Project		30,211
			Additional		21,356

Electricity Use – MC to VPPS conveyor (Scope 3)

Scenario	Energy Use	Emission Factors		
		CO_2	CH_4	N_20
	GJ	kg CO_2-e/GJ	kg CO_2-e/GJ	kg CO_2-e/GJ
Project	96,645	248	N/A	N/A
Additional	68,318	t CO_2-e	t CO_2-e	t CO_2-e
Total GHG Emissions (t CO_2-e)		Project		25,968
		Additional		16,943



APPENDIX B

Calculation of Export Scenario Emissions

Assumed Production Rates

Scenario	Assumed Production Rate based on mine planning (t ROM coal/ annum)							
	2023	2024	2025	2026	2027	2028	2029	Total
Approved	1,562,287	1,561,468	810,602	0	0	0	0	**3,934,357**
Project	1,734,287	1,903,933	1,572,019	1,813,780	1,989,631	2,750,000	1,659,333	**13,422,983**
Additional	172,000	342,465	761,417	1,813,780	1,989,631	2,750,000	1,659,333	**9,488,627**
Additional Export				660,000	660,000	660,000	660,000	**2,640,000**

Stationary Diesel Use (Scope 1)

Activity Data		Energy Use		Emission Factors		
				CO_2	CH_4	N_2O
kL		GJ/kL	GJ	kg CO_2-e/GJ	kg CO_2-e/GJ	kg CO_2-e/GJ
Project	5,879	38.6	226,940	69.9	0.1	0.2
Additional	4,156	38.6	160,422	69.9	0.1	0.2
				t CO_2-e	t CO_2-e	t CO_2-e
Breakdown of individual GHG emissions (t CO_2-e)		Total		15,863	23	45
		Additional			16	32
Stationary Diesel Use GHG Emissions (t CO_2-e)				Project		15,931
				Additional		11,262

Scope 1 Fugitive Emissions Estimate Calculations

- Emissions from ROM Coal Extraction (including Post Mining Emissions from ROM coal once extracted) calculated from coal seam gas content within ROM Coal (emissions per tonne).
- Legacy Fugitive Emissions associated with emissions from previously mined areas (unrelated to ROM extraction rate) calculated from NGERS estimates (2016/17, 2017/18 and 2019/20 and 2020/1[9]) by removing estimated emissions from ROM coal based on Fassifern Gas content.
- ROM Coal Extraction emissions based on Project incremental ROM tonnes relative to 'Approved' operations.
- Legacy Fugitive Emissions based on extended life of operations relative to Existing Consents (2 Years).

Fassifern Seam Gas Content Calculation Inputs

Gas Component	
Gas Content Fassifern Seam - CVC Mining Area (m^3/t ROM Coal)	5.30
Methane (CH4) percentage of Fassifern Seam Gas	97%
Carbon Dioxide (CO2) percentage of Fassifern Seam Gas	3%
Methane Global Warming Potential factor	28

[9] 2018-19 NGERS data for operations not available. NGERs estimates adjusted to reflect increase GWP for CH_4 of 28 based on Fassifern Seam gas content percentage

Fugitive emissions (attributable to ROM – includes post mining emissions) (Scope 1)

Domain	Activity Data	Emission Factors	
		CO_2	CO_2/CH_4
	ROM coal tonne	t CO_2-e/ ROM t	
Project	13,422,983	0.098	
Additional	9,488,627	0.098	
Fugitive Emissions attributable to ROM	Project	1,314,784	
	Additional	929,413	

Fugitive emissions (Legacy from old Operations) (Scope 1)

Combined NGER data CVC and Mannering	Fugitive Emissions (NGERS[10])	Revised Fugitive Emissions Estimate[11]	ROM Production	Historical Fugitive Emissions from ROM	Legacy fugitive emissions[12]
Year	t CO_2-e	t CO_2-e	ROM (t)	t CO_2-e [13]	t CO_2-e
FY2016/2017	517,552.18	577,795.25	1,378,996.00	120,645	442,722
FY2017/2018	715,012.42	798,239.87	758,110.00	66,325	723,983
FY2019/2020	582,861.20	650,706.24	1,120,973.39	98,071	540,907
FY 2021/2022	499,706.60	499,706.60	1,489,783.14	145,925	353,782
Average Annual Legacy Fugitive Emissions					515,348
Legacy Emissions associated with 2 year extension of LOM (t CO_2-e)					1,030,697

[10] As calculated for NGERS Reporting. Methane contribution based on GWP of 25 except 2020/21 which applies GWP of 28.
[11] Methane GWP of 28, calculated based on Fassifern Seam gas concentrations
[12] Based on Revised Fugitive Estimate
[13] Calculated from Fassifern Seam Gas Content Data: 5.30 m^3/tonne, 97% CH_4, 3% CO_2

Electricity Use (Scope 2)

Calculated Site Electricity Use (GJ/ROM Tonne) of 0.104 from 2017-20 electricity use and ROM coal production rates

Component	Activity Data		Emission Factors
	ROM Coal tonne	Calculated Energy Use (GJ)	kg CO_2-e/GJ
Project	13,422,983	1,399,717	224
Additional	9,488,627	989,451	
GHG Emissions – Energy Use	Project		313,536
	Additional		221,637

Product use (Scope 3) – Bituminous Coal

Activity Data		Energy Production		Emission Factors		
				CO_2	CH_4	N_20
Component	Product (t)	GJ/Product t	GJ	kg CO_2-e/GJ	kg CO_2-e/GJ	kg CO_2-e/GJ
Project	13,422,983	27.0	362,420,554	90	0.04	0.2
Additional	9,488,627		256,192,926			
Total GHG Emissions (t CO_2-e)				Project		32,704,831
				Additional		23,118,850

Extraction, Production and Distribution of Energy Purchased (Scope 3)

Activity Data			Emission Factors		
			CO_2	CH_4	N_20
Purchased energy		GJ	kg CO_2-e/GJ	kg CO_2-e/GJ	kg CO_2-e/GJ
Diesel	Project	226,940	3.6	N/A	N/A
	Additional				
Electricity	Project	1,399,717	24	N/A	N/A
	Additional				
Total GHG Emissions (t CO_2-e)			Project		30,211
			Additional		21,356

Electricity Use – MC to VPPS conveyor (Scope 3)

Scenario	Energy Use	Emission Factors		
		CO_2	CH_4	N_20
	GJ	kg CO_2-e/GJ	kg CO_2-e/GJ	kg CO_2-e/GJ
Project	96,645	248	N/A	N/A
Additional	68,318	t CO_2-e	t CO_2-e	t CO_2-e
Total GHG Emissions (t CO_2-e)		Project		23,968
		Additional		12,229

Product Transport – Truck (Scope 3)

Activity Data					Emission Factors
					Full Life Cycle – Scope 3
Scenario	Transport mode	Total Product (t)	Distance (km)	Diesel Usage (GJ)	kg CO_2-e/GJ
Project	Truck (32 t)	4,620,000	140	425,991	74.1
Additional		2,640,000	140	243,423	
Total GHG Emissions (t CO_2-e)				Project	31,566
				Additional	18,038

Product Transport – Ship (Scope 3)

Activity Data					Emission Factors
					CO_2
Scenario	Product (t)	Transport mode	Distance (km)	Tonne km (Tkm)	kg CO_2-e/Tkm
Project	4,620,000	Ship - Export	9,500	43,890,000,000	0.0126
Additional	2,640,000			25,080,000,000	
Total GHG Emissions (t CO_2-e)				Project	553,014
				Additional	316,008

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