BHP

Pilbara Regional

Greenhouse Gas Management Plan

December 2023

Disclaimer

Due to the inherent uncertainty and limitations in measuring greenhouse gas (GHG) emissions and operational energy consumption under the calculation methodologies used in the preparation of such data, all GHG emissions and operational energy consumption data or references to GHG emissions and operational energy consumption volumes (including ratios or percentages) in this document are estimates. There may also be differences in the manner that third parties calculate or report GHG emissions or operational energy consumption data compared to BHP, which means that third-party data and benchmarking may not be comparable to our data.

Version Control

Note: This Regional GHGMP (other than the Schedules) shall be reviewed and updated every 3 years or otherwise as required in accordance with Section 3.1. The inclusion of additional Schedules will not necessarily include updates to the remainder of the Regional GHGMP.

Version	Description of version	Key changes	Issue date
Version 1	Version for submission to EPA	Original document	18 December 2023

Executive summary

BHP Iron Ore Pty Ltd (BHPIO) operates an integrated system of four processing hubs and six open-cut mines connected by more than 1,000 kilometres (km) of railway infrastructure in the Pilbara region of Western Australia. These operations are subject to various existing approvals, including under Part IV and/or Part V of the *Environmental Protection Act 1986* (EP Act).

This Pilbara Regional Greenhouse Gas Management Plan (Regional GHGMP) identifies BHPIO's approach to managing greenhouse gas (GHG) emissions to meet the Environmental Protection Authority's (EPA) objective: *to minimise the risk of environmental harm associated with climate change by reducing GHG emissions as far as practicable*.

Recognising that GHG emissions are best managed with a broad regional perspective, rather than being a localised issue, BHPIO has developed the Regional GHGMP, which will apply to BHPIO's Pilbara operations authorised under Part IV of the EP Act, to facilitate a holistic and longer-term view of BHPIO's mining activities. The Regional GHGMP establishes a consistent GHG emissions management framework across BHPIO's relevant Pilbara operations.

The Regional GHGMP also considers the particular circumstances of relevant individual operations in the Pilbara, as set out in the schedules to this Regional GHGMP (Proposal Specific Schedules). The Proposal Specific Schedules must be read and considered in conjunction with the body of this Regional GHGMP.

BHP Group Limited (BHP) recognises the need for an acceleration of effort to decarbonise, drive energy efficiency and to develop and deploy low or zero emissions technologies. BHP is committed to supporting the ambition of the Commonwealth Government to reduce Australia's GHG emissions by 43% by 2030, and the Commonwealth and Western Australian Governments' target of net zero emissions by 2050.

BHPIO will continue to evaluate the Regional GHGMP and seek to take advantage of technology and availability of renewable power sources as they evolve.

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Abbreviations and definitions

Term	Meaning
BF-BOF	Blast furnace to basic oxygen furnace
BHP	BHP Group Ltd or the BHP group of companies, as the context requires
BHPIO	BHP Iron Ore Pty Ltd as operator of BHP's iron ore mines in WA
CEO	Chief Executive Officer
CCGT	Combined Cycle Gas Turbines
CER	Clean Energy Regulator
CH_4	Methane
CO_2	Carbon dioxide
CO_2-e	Carbon dioxide equivalence
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DWER	Department of Water and Environmental Regulation
EIA	Environmental Impact Assessment
EPA	Western Australian Environment Protection Authority
EP Act	*Environmental Protection Act 1986*
ERF	Emissions Reduction Fund
ETA	Environmental Technologies Analytics
FullCAM	Full Carbon Accounting Model
FY	Financial Year
GHG	Greenhouse Gas
GHGMP	Greenhouse Gas Management Plan
GJ	Gigajoule
GRE	Gas Reciprocating Engines
GWP	Global Warming Potential
HFCs	Hydro Fluorocarbons
HRSG	Heat Steam Recovery Generators
Instructions	*Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans*
IEA	International Energy Agency
kL	Kilolitre
km	Kilometre
KNAC	Karlka Nyiyaparli Aboriginal Corporation
LULUCF	Land Use, Land Use Change and Forestry
MAC PS	Mining Area C Power Station
MS439	MS 439 (as amended by MS 1012) – Orebody 18 Iron Ore Mine
MS1012	MS 1012 – Orebody 31 Iron Ore Mine
MS1126	MS 1126 Jimblebar Iron Ore Project (Revised Proposal)
MS	Ministerial Statement
Mt	Million tonnes
Mtpa	Million tonnes per annum
MW	Megawatt
MWh	Megawatt hour

NCAS	National Carbon Accounting System
NGER	National Greenhouse and Energy Reporting (Scheme)
NGER Act	*National Greenhouse and Energy Reporting Act 2007*
N-1	Means adequate generation capacity that is dispatchable on demand to meet peak daily demand when the largest generator unit is out of service.
N_2O	Nitrous oxide
OEM	Original Equipment Manufacturer
Orebody 32 Derived Proposal	The Orebody 32 Below Water Table (Newman Hub) Derived Proposal referred to the EPA on 28 October 2022
OSA	Overburden Storage Area
PFCs	Perfluorocarbons – Greenhouse Gases
Proposal Specific Schedules	Schedules to this document
Regional GHGMP	This document
Regional GHGMP Boundary	As defined in Section 1.3
RET	Renewable Energy Target
RPP	Renewable power percentage
SF_6	Sulphur Hexafluoride
SME	Subject Matter Expert
SPP	Solar Power Plant
Strategic Proposal	The Pilbara Expansion Strategic Proposal referred to the EPA on 6 July 2012
Strategic Proposal GHGMP	The GHGMP version 1.1 dated July 2023 referred under the Western Ridge Derived Proposal and Orebody 32 Derived Proposal
tCO_2-e	Tonnes of Carbon Dioxide Equivalent
TPS	Temporary Power Station
WAIO	BHP Western Australian Iron Ore
Western Ridge Derived Proposal	The Western Ridge (Newman Hub) Derived Proposal referred to the EPA on 26 January 2023

1 Context, scope and purpose

1.1 BHPIO operations

BHPIO operates an existing integrated system of four mining hubs (Mining Area C, Jimblebar, Newman Operations and Yandi) and six open-cut mines, connected by more than 1,000 km of railway infrastructure and port facilities in the Pilbara region of Western Australia.

Integrated mining hubs are powered by Yarnima Power Station (Yarnima), a combined cycle gas turbine power station owned and operated by BHPIO located in Newman in the Pilbara region of Western Australia. Yarnima supplies electricity to BHPIO's mines and the Newman township via the BHPIO inland electricity grid.

Iron ore is transported from BHPIO's mining hubs by rail infrastructure to port facilities at Port Hedland, where it is loaded, for export by sea. Figure 1 provides an overview of BHPIO's existing Pilbara operations.

BHPIO is the proponent of the proposals in the Proposal Specific Schedules, which are part of its Pilbara operations. The Regional GHGMP applies to those proposals, which are either subject to a Part IV EP Act Ministerial Statement with a condition requiring compliance with this Regional GHGMP or derived proposals as described in Section 1.1.1 below (**Proposals**).

1.1.1 Pilbara Expansion Strategic Proposal

The Regional GHGMP applies to derived proposals where the Minister has determined that implementation of a proposal is subject to Condition 12 of MS1105, excluding the Western Ridge Derived Proposal and the Orebody 32 Derived Proposal until the date on which they are expressly included in the Regional GHGMP, by way of a revision of the Strategic Proposal GHGMP.

BHP referred the Pilbara Expansion Strategic Proposal (Strategic Proposal) to the EPA under Part IV of the EP Act on 6 July 2012 for its future operations in the Pilbara for the next 50 to 100 years. The Strategic Proposal includes new mining operations and future expansions to existing mining operations, and associated infrastructure developments in the Pilbara. The Minister for Environment issued Ministerial Statement 1105 (MS1105) for the Strategic Proposal on 11 July 2019, which sets out the implementation agreement. MS1105 manages impacts to the environment at a landscape scale.

A proposal to implement one or more of the developments identified in the Strategic Proposal and listed in Table 2 of Schedule 1 to MS1105 may be declared to be a derived proposal pursuant to section 39B of the EP Act. The developments include iron ore mines and associated activities and operations, and future expansions to new mining operations. Figure 2 illustrates the Strategic Proposal boundary and current mining operations within the Strategic Proposal.

The new mining operations and expansions comprising the Strategic Proposal will be implemented as part of integrated mining hubs, using shared processing plant and transport infrastructure.

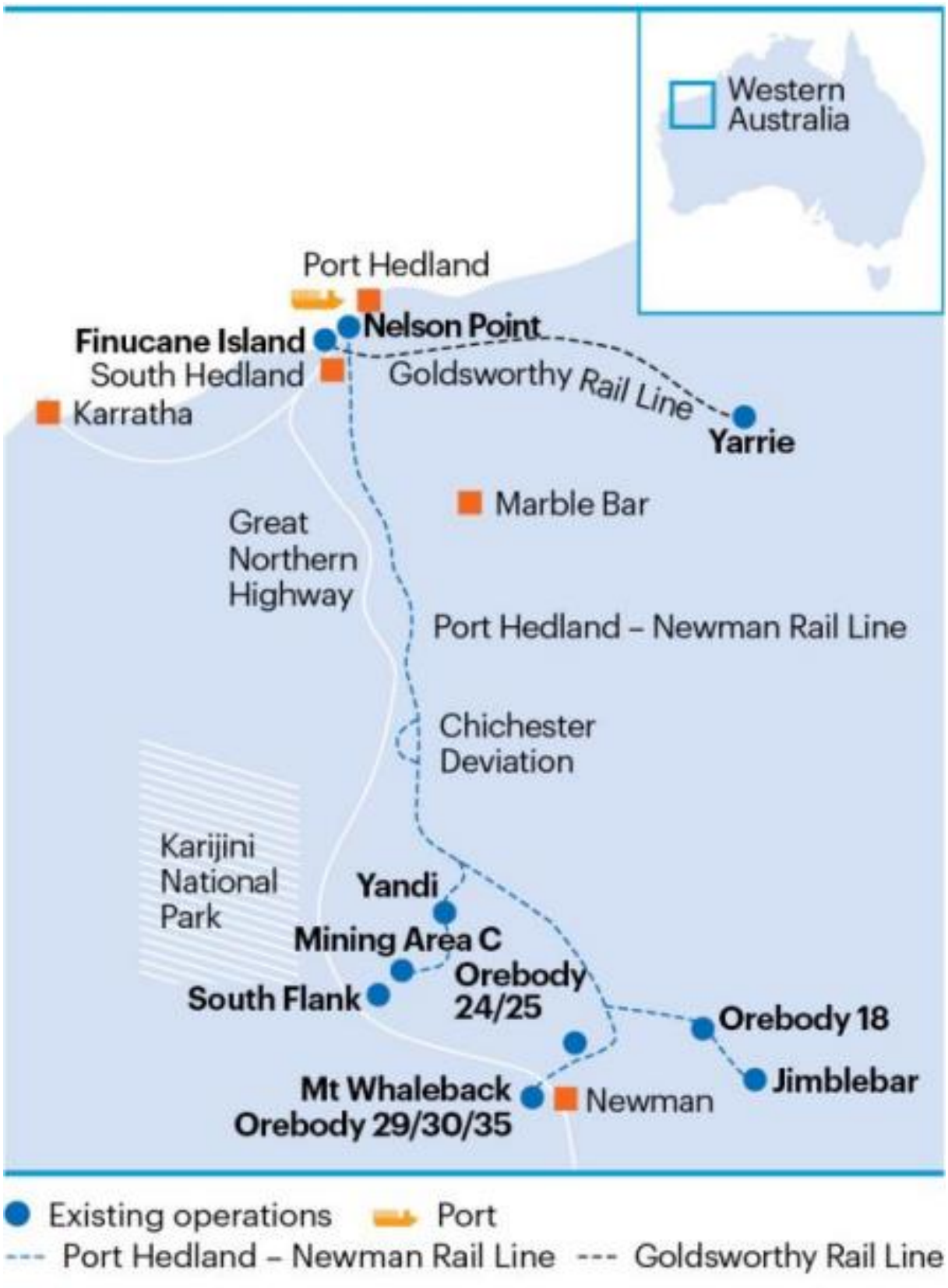


Figure 1: Summary of BHPIO's existing operations in the Pilbara

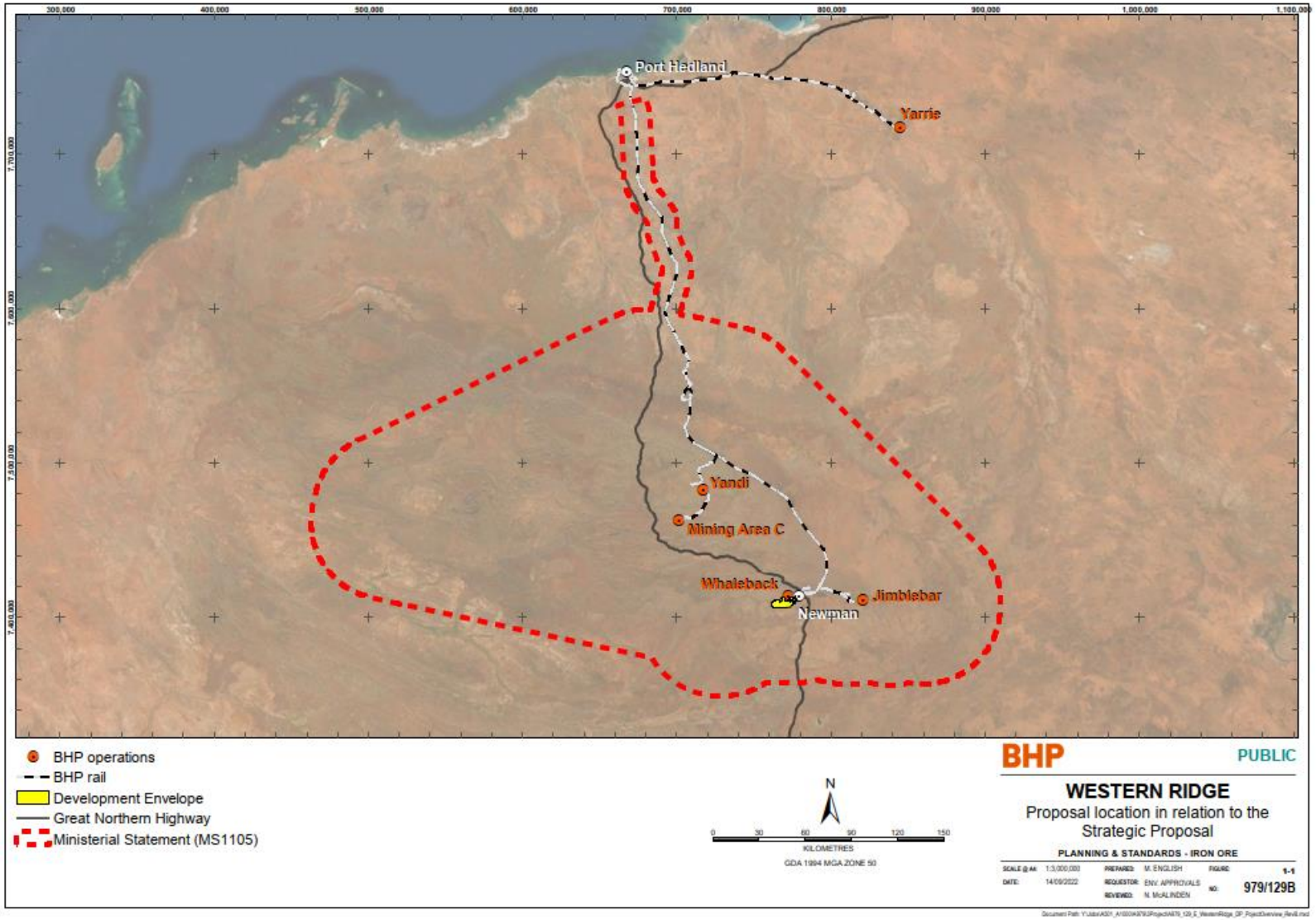


Figure 2: Location of the Strategic Proposal approved under MS1105 and the Regional GHGMP boundary

1.2 Purpose

The purpose of this Regional GHGMP is to establish a consistent GHG emissions management framework applicable to BHPIO operations in the Pilbara region of Western Australia, being the Proposals, and demonstrate the following in respect of those Proposals:

- BHPIO's contribution towards the Western Australian and Commonwealth Governments' aspiration of net zero emissions by 2050
- the consideration given to evolving Western Australian and Commonwealth legislative and policy settings, including new international commitments, through which the net zero emissions by 2050 aspiration is intended to be delivered
- progressive reduction of Scope 1 emissions through the setting of indicative emissions reduction trajectories
- that all reasonable and practicable measures have been considered to avoid, reduce and offset Scope 1 emissions
- that consideration has been given to opportunities to reducing BHPIO's downstream and other Scope 3 emissions where reasonably practicable.

This Regional GHGMP outlines requirements that apply to the Proposals in the Pilbara, including how GHG emissions are monitored and managed to minimise BHPIO's contribution to global GHG emissions.

Implementing this Regional GHGMP will mitigate the impacts of GHG emissions from BHPIO's operations in the Pilbara within the Regional GHGMP Boundary (as defined below) and meet the EPA's objective to minimise the risk of environmental harm associated with climate change by reducing GHG emissions as far as practicable.

1.3 Scope

This Regional GHGMP applies to the Proposals defined in the Proposal Specific Schedules and establishes a consistent framework that can be applied to BHPIO's operations at the asset level (i.e BHP Western Australian Iron Ore (WAIO)). The geographical area covered by this Regional GHGMP is the same as the Strategic Proposal, set out in Figure 2 (**Regional GHGMP Boundary**).

Emissions reduction trajectories, emissions management measures applied at the Proposal level, and other Proposal specific information is set out in the Proposal Specific Schedules. The Proposal Specific Schedules should be read and considered in conjunction with the body of this Regional GHGMP.

The Regional GHGMP is intended to apply to all future Proposals within the Regional GHGMP Boundary that are subject to a Part IV EP Act Ministerial Statement, including derived proposals under MS1105.

1.4 Legislative and policy setting for GHG emissions reductions

This Regional GHGMP has been developed to meet the overarching objective of the EPA in respect of GHG emissions, and to address applicable EP Act Ministerial Statement conditions requiring implementation of a GHGMP and/or to reduce GHG emissions.

The EPA's overarching objective in respect of GHG emissions is:

> *"To minimise the risk of environmental harm associated with climate change by reducing greenhouse gas emissions as far as practicable."* Environmental Factor Guideline: Greenhouse Gas Emissions (EPA 2023)

This Regional GHGMP has been prepared with due consideration of the following legislation and policy:

- WA Government's Greenhouse Gas (GHG) Emissions Policy for Major Projects (GoWA 2019)
- Environmental Factor Guideline: Greenhouse Gas Emissions (EPA 2023)
- *Climate Change Act 2022*
- *National Greenhouse and Energy Reporting Act 2007*, as amended by the *Safeguard Mechanism (Crediting) Amendment Act 2023*
- National Greenhouse and Energy Reporting (Safeguard Mechanism) Rule 2015, as amended by the National Greenhouse and Energy Reporting (Safeguard Mechanism) Amendment (Reforms) Rules 2023, Carbon Credits (Carbon Farming Initiative) Amendment (No. 2) Rules 2023 and Australian National Registry of Emissions Units Rules 2023
- *Renewable Energy (Electricity) Act 2000*
- BHP Climate Change Report (BHP 2020a)
- BHP Climate Transition Action Plan (BHP 2021).

BHPIO applied a risk-based approach to identify and prioritise the components of this Regional GHGMP, using available information from recent investigations and studies and applying learnings from the management of GHG emissions, across its Proposals in the Pilbara.

The management approaches discussed in this Regional GHGMP apply the mitigation hierarchy of 'avoid, reduce, offset' for BHPIO's GHG emissions within the Regional GHGMP Boundary. While BHP prioritises structural abatement (emissions reductions at its operated assets), it acknowledges a role for offsets in a temporary or transitional capacity while abatement options are being studied, as well as for 'hard to abate' emissions with limited or no current technological solutions. This approach will be applied to the Proposals and is reflected in this Regional GHGMP.

1.4.1 Climate Change Act 2022

In September 2022 the Commonwealth Parliament passed the *Climate Change Act 2022* (Cth) (CC Act), which enshrined into law Australia's updated nationally determined contribution under Article 4 of the Paris Agreement. The emissions reduction targets are 43% below 2005 levels (as a floor) by 2030 and net zero by 2050. The Government has underlined that policies may seek to achieve more ambitious targets than the legislated level.

1.4.2 NGER Act and Safeguard Mechanism

The NGER Act and Safeguard Mechanism provide contemporary, robust, transparent and enforceable regimes to deliver GHG emissions reductions commensurate to Australia's international obligations. Significant penalties and other enforcement options apply for failure to comply with the NGER Act and the Safeguard Mechanism. The Clean Energy Regulator (CER) and the Commonwealth Government also have wide ranging tools to monitor compliance.

The NGER Act requires BHPIO to annually report the total emissions associated with activities leading to Scope 1 and Scope 2 emissions under BHPIO's operational control. These Scope 1 and Scope 2

emissions are grouped into 'facilities' which are defined in accordance with the *NGER (Measurement) Determination 2008*.

NGER facilities which emit greater than 100,000 tCO_2-e of Scope 1 emissions per year are designated large facilities and subject to regulation under the Safeguard Mechanism.

Significant reforms to the NGER Act and Safeguard Mechanism took effect on 1 July 2023. The reforms are directed at ensuring covered facilities achieve a proportionate share of Australia's emissions reductions target.

Key components of the NGER Act and Safeguard Mechanism reform framework are:

1. New legal objects in the NGER Act, including:
    - ensuring that total net Safeguard emissions (emissions from all covered facilities) for all of the financial years between 1 July 2020 and 30 June 2030 do not exceed a total of 1,233 million tonnes CO_2-e (known as the 'hard cap');
    - ensuring that net total Safeguard emissions decline to no more than 100 million tonnes CO_2-e for the financial year beginning on 1 July 2029; and
    - the 5-year rolling average of total Safeguard emissions for each financial year that begins after 30 June 2024 are lower than the past 5-year rolling average Safeguard emissions for that financial year.
2. Requiring the Safeguard Mechanism Rule to be consistent with the above objects. There are triggers for the Minister to have to consider amending the Rules (including a public consultation process) if the Climate Change Authority (CCA) or the Secretary to DCCEEW advises the Minister that emissions are not declining consistently with the trajectory listed above, or in line with Australia's emission reduction target and net-zero by 2050 commitment.
3. Change to the manner in which facility baselines are set, with all facilities are subject to a production adjusted baseline. For existing facilities, site specific emissions intensity values will initially be used in the baseline calculation for existing facilities, with a gradual transition to industry benchmark emissions intensity values during the period through to 2030. International best practice emissions intensity will be required immediately for new facilities or new outputs from existing facilities.
4. An annual baseline decline rate for all facilities through until 2050. The default annual baseline decline rate is set at 4.9% for financial years commencing 1 July 2023 to 1 July 2029. From 1 July 2030, the decline rate has been notionally set at 3.285%, which represents a linear trajectory to net zero by 2050. Emission limits will be periodically monitored and updated by Government to ensure the scheme remains effective.
5. Baselines operate as a compliance limit and facilities must undertake abatement activities at site and/or use carbon credits to meet the declining baseline. Only Australian Carbon Credit Units (ACCU) or Safeguard Mechanism Credits (SMC) may be used. Any use of carbon offsets (e.g. ACCUs) in excess of 30% will trigger the requirement for a public statement explaining why more onsite abatement has not been undertaken.
6. Transparency in respect of all key aspects of the regime. This including publishing of facility baselines, Scope 1 emissions data and ACCUs and/or SMCs surrendered by the CER each year. In addition, CCA must provide an independent report as part of the Annual Climate

Change Statement. The statement reports Australia's progress against emission reduction goals, factoring both existing Safeguard Mechanism participants and proposed expansions, identified.

1.4.3 Renewable Energy Target

The Renewable Energy Target (RET) is a Commonwealth Government scheme to increase the proportion of electricity generated in Australia from renewable sources, to reduce GHG emissions from electricity generation and to promote the development of a renewable energy industry in Australia.

The scheme provides the mechanism for achieving the target through creation and trading of renewable energy certificates. RET-liable entities must purchase a certain percentage of their electricity from renewable sources each year through the purchase of renewable energy certificates, defined by the renewable power percentage (RPP). The RPP is set each calendar year by the CER, taking into account yearly interim targets set in legislation.

The RPP is set each calendar year by the Clean Energy Regulator, taking into account yearly interim targets set in legislation. In 2023 the RPP is 18.96 %, which means that liable entities must surrender certificates to cover 18.96 % of their electricity purchases.

Yarnima Power Station, which supplies electricity to BHPIO's operations within the Regional GHGMP Boundary, is covered by both the Safeguard Mechanism and RET. Scope 2 emissions reported through the NGER Act use the grid average and do not currently account for specific sourcing of low-emissions electricity or surrender of renewable energy credits.

2 Emissions estimates and emission reduction trajectory

2.1 Identification and estimates of GHG emissions

2.1.1 Overview of Safeguard Mechanism facilities

BHPIO is the responsible emitter in respect of a number of designated large facilities that are covered by the Safeguard Mechanism. The facilities described below are located within the Regional GHGMP Boundary and are relevant to the Proposals subject to this Regional GHGMP. All derived proposals declared under MS1105 also fall within the scope of one or more of the below facilities.

Table 1 summarises the links between the NGER facility and the Safeguard Mechanism production variable and default emissions intensity, applicable to determine emission baselines through the Safeguard Mechanism (Section 2.2).

Table 1: Summary of Safeguard Mechanism coverage of BHPIO's operations

NGER Facility	Production Variable
ARC01 Mining Area C – MNG Facility and MAC Power Station	Iron ore default emissions intensity of 0.00476 tCO_2-e per tonne of iron ore applicable Megawatt hours of electricity generation default emissions intensity of 0.539 tCO_2-e applicable
Jimblebar Mine	Iron ore default emissions intensity of 0.00476 tCO_2-e per tonne of iron ore applicable
Newman Operations	Iron ore default emissions intensity of 0.00476 tCO_2-e per tonne of iron ore applicable
YAN01 Yandi/Marillana Creek Mine – MNG Facility	Iron ore default emissions intensity of 0.00476 tCO_2-e per tonne of iron ore applicable
Yarnima Power Station	Megawatt hours of electricity generation default emissions intensity of 0.539 tCO_2-e applicable
PRL03 Rail – IOR Facility	Net-tonne-kilometres of bulk freight on a dedicated line default emissions intensity of 5.29 x 10^{-6} tCO_2-e per net-tonne-kilometre applicable

ARC01 Mining Area C – MNG Facility (Mining Area C and South Flank)

BHPIO currently operates an iron ore hub and mining operations at Mining Area C (North Flank), located approximately 100 km north-west of Newman in the Pilbara region of Western Australia, and a satellite ore body at South Flank which is included as part of the defined NGER facility, Mining Area C.

The Mining Area C NGER facility produces iron ore through conventional open-pit iron ore mining of the mineralised Marra Mamba Iron Formation. The Mining Area C NGER facility reports the energy and

emissions from activities which support the production of iron ore up to where iron ore is loaded onto BHPIO's railway, which is a separate facility as discussed below.

Activities contributing toward covered emissions at Mining Area C include:

- Drill & Blast: Diesel consumed as fuel for drill rigs
- Load & Haul: Diesel consumed by mobile equipment such as excavators and haul trucks moving ore from pits to ore handling plant (crushers)
- Dewatering & Water Handling: Diesel consumed by pumps to abstract ground water, transport water across site to release points, required to facilitate dry conditions where mining below water table
- Power Generation (on-site): Diesel consumed for site-based electricity generation
- Petroleum Based Oils: Primarily used to support operation of mobile plant (e.g. haul trucks)
- Sulfur Hexafluoride: Leakages of SF_6 from electrical switchgear.

Jimblebar Mine (Jimblebar and Orebody 18)

BHPIO operates an iron ore hub and mining operations at Wheelara Hill (Jimblebar), located approximately 40 km east of Newman in the Pilbara region of WA.

Jimblebar produces iron ore through conventional open-pit iron ore mining from Wheelara Hill, Orebody 18 and Orebody 31. The NGER facility, Jimblebar Mine, reports the energy and emissions from activities supporting the production of iron ore to where iron ore is loaded onto BHPIO's railway.

Activities contributing toward covered emissions at Jimblebar include:

- Drill & Blast: Diesel consumed as fuel for drill rigs
- Load & Haul: Diesel consumed by mobile equipment such as excavators and haul trucks moving ore from pits to ore handling plant (crushers)
- Dewatering & Water Handling: Diesel consumed by pumps to abstract ground water, transport water across site to release points, required to facilitate dry conditions where mining below water table
- Petroleum Based Oils: Primarily used to support operation of mobile plant (e.g. haul trucks)
- Sulfur Hexafluoride: Leakages of SF6 from electrical switchgear.

Newman Operations (Whaleback, Eastern Ridge and Western Ridge)

Newman Operations is the aggregation of two NGER facilities, Eastern Ridge and Whaleback, which were reported separately up to and including FY2018-19. From the FY2019-20 NGER reporting period onwards, the two facilities were combined to better reflect operational changes. The Newman Operations facility is located approximately 6 km west of Newman in the Pilbara region of WA.

The Newman Operations hub produces iron ore through open-pit iron ore mining methods and also processes and upgrades iron ore extracted from Orebody 18 (OB18), which is located within a separate NGER facility (Jimblebar Mine). The NGER facility, Newman Operations, reports the energy and emissions from activities supporting the production of iron ore to where iron ore is loaded onto BHPIO's railway.

- Drill & Blast: Diesel consumed as fuel for drill rigs
- Load & Haul: Diesel consumed by mobile equipment, including excavators and haul trucks moving waste and ore from pits to ore handling plant (OHP, i.e., crushers)
- Petroleum-based oils are also used to support operation of mobile equipment (e.g., haul trucks)
- Dewatering & Water Handling: Diesel consumed by pumps to abstract ground water and transport water across site to release points, required to facilitate dry conditions where mining below water table
- Sulfur Hexafluoride: Leakages of SF_6 from electrical switchgear.

YAN01 Yandi/Marillana Creek Mine – MNG Facility (Yandi)

Yandi is located approximately 178 km north-west of Newman in the Pilbara region of WA (Figure 1). The Yandi hub produces iron ore through open-pit iron ore mining methods. The NGER facility, Yandi, reports the energy and emissions from activities supporting the production of iron ore to where iron ore is loaded onto BHPIO's railway.

- Drill & Blast: Diesel consumed as fuel for drill rigs and as an additive to explosive, ammonium nitrate fuel oil used in developing the orebody
- Load & Haul: Diesel consumed by mobile equipment such as excavators and haul trucks moving ore from pits to ore handling plant (crushers)
- Dewatering & Water Handling: Diesel consumed by pumps to abstract ground water, transport water across site to release points, required to facilitate dry conditions where mining below water table
- Petroleum Based Oils: Primarily used to support operation of mobile plant (e.g. Haul Trucks)
- Sulfur Hexafluoride: Leakages of SF_6 from electrical switchgear.

Yarnima Power Station

Yarnima is a combined cycle gas turbine (CCGT) power station located in Newman in the Pilbara region of WA. The power station operates gas turbines equipped with heat recovery steam generators to capture waste heat. Waste heat recovery generates additional power, reducing gas use for electricity generation and increasing the overall thermal efficiency and reducing carbon emissions intensity of the power station.

In the event of a gas supply interruption or shortfall, the power station is configured to allow normal operations to continue using diesel fuel. Yarnima supplies electricity to BHPIO's mines and the Newman township via BHPIO's inland electricity grid.

Activities contributing toward GHG emissions at Yarnima may include:

- Combustion of natural gas for electricity generation
- Combustion of diesel for electricity generation
- Sulfur Hexafluoride: Leakages of SF_6 from electrical switchgear.

To avoid double-counting of Scope 1 and Scope 2 emissions, the NGER Act requires BHPIO to report the Scope 1 emissions associated with electricity generation at Yarnima Power Station, with the emissions associated with electricity used at BHPIO's mines not reportable in accordance with the NGER Act.

PRL03 Rail – IOR Facility

BHPIO's mining hubs are connected by more than 1,000 km of railway infrastructure in the Pilbara region of WA. This railway infrastructure is dedicated for BHPIO's sole use and rail transport activities are operated by BHPIO. The NGER facility, PRL03 Rail – IOR Facility reports the energy and emissions from activities which support the transport of iron ore from BHPIO's mining hubs, where it is loaded, to Port Hedland where iron ore is unloaded for export.

Activities contributing toward covered emissions at PRL03 Rail – IOR Facility include:

- Rail Freight: Diesel consumed by locomotives, transporting iron ore from mines to port
- Ancillary: Diesel consumed through maintenance and inspection activities of the railway network
- Power Generation (on-site): Diesel consumed at remote sites for power supply.

2.1.2 GHG types and Global Warming Potentials

The types of GHG estimated from the Proposals the subject of this Regional GHGMP are provided in Table 2 with their corresponding Global Warming Potentials (GWP). GHG emissions from these sources are required to be reported under the NGER Act and are included within the scope of this Regional GHGMP. The emissions inventory is based on NGER Act reportable activities occurring within the Regional GHGMP Boundary.

Table 2: GHG and GWP (CER 2022)

Greenhouse gas	GWP (2023-24 onwards)
Carbon dioxide (CO_2)	1
Methane (CH_4)	28
Hydrofluorocarbons (HFCs)	116 – 12,400 (Dependent of HFC type)
Nitrous oxide (N_2O)	265
Perfluorocarbons (PFCs)	8,550 – 11,100 (Dependent of PFC type)
Sulphur hexafluoride (SF_6)	23,500
Nitrogen trifluoride (NF_3)	See comment below

As of compilation number 23 (12 April 2023) NF_3 is not a listed greenhouse gas in the NGER Act.[1] NF_3 is used in a relatively small number of industrial processes. It is primarily produced in the manufacture of semiconductors and LCD (Liquid Crystal Display) panels, and certain types of solar panels and chemical lasers (WRI, 2013). There are no scope 1 emissions sources of NF_3 associated with the Proposals in the Regional GHGMP Boundary.

Sulphur Hexafluoride (SF6) emissions have been considered and evaluated as immaterial.[1] Annual GHG emissions inventory reporting required by the NGER Act of BHPIO's existing iron ore mining operations continues to validate this category of GHG emissions to be marginal. BHPIO's NGER reporting has been and continues to be independently assured to a reasonable assurance level.

2.1.3 Potential sources of Scope 1 emissions

BHPIO has adopted the NGER Act framework as a basis of identifying and estimating all sources of Scope 1 emissions generated for activities occurring within the Regional GHGMP Boundary.

The following sources of emissions are included in the scope of this Regional GHGMP:

Scope 1 emissions sources (mining)

- Diesel used for heavy haulage, primarily movement of ore and waste material using haul trucks
- Diesel used for ancillary equipment such as excavators, drills, and other equipment used to support mine development
- Diesel energy powering dewatering activities, including abstraction of groundwater and movement of water across operations
- Oils and greases, primarily used in heavy equipment

[1] BHPIO's operations and regulatory emissions reporting guidance are subject to change, which may influence emission sources considered in the Regional GHGMP in future.

- Land clearing, made up of embodied emissions associated with vegetation[2].

Scope 1 emissions sources (electricity supply)

Emissions associated with generation and transmission of electricity at Yarnima Power Station, including existing infrastructure and activities proposed, including:

- Natural gas consumed for power generation
- Diesel consumed for power generation, including backup and black-start operations
- Land clearing, made up of embodied emissions associated with vegetation
- Leakages of sulfur hexafluoride from electrical switchgear.

Scope 1 emissions (rail operations)

Emissions associated with the transport of iron ore via rail from mining hub to Port Hedland, including:

- Diesel consumed by locomotives and rail maintenance activities
- Diesel power generation, supporting remote camps.

Scope 2 emissions

There are no Scope 2 emissions associated with this Regional GHGMP. Electricity generation and supply for BHPIO's operations within the Regional GHGMP Boundary is self-generated. Scope 2 emissions are the embodied emissions associated with purchased electricity from third parties.

Each Proposal's emissions associated with electricity produced by Yarnima are represented in this Regional GHGMP as Scope 1 as they occur within the Regional GHGMP Boundary.

2.1.4 Downstream and Scope 3 emissions

Mining Proposals

Emissions associated with BHPIO's activities downstream of the Regional GHGMP Boundary are considered in the same way as Scope 3 emissions in this Regional GHGMP.

Iron ore produced within the Regional GHGMP Boundary is transported to Port Hedland via BHPIO's owned and operated rail operations for export by sea. Rail maintenance workshops which service rolling-stock are located in Port Hedland outside of the Regional GHGMP Boundary. Electricity consumed in Port Hedland is sourced from the North West Interconnected System (NWIS), and considered an indirect source of emissions in this Regional GHGMP.

BHPIO's Port Hedland operations are located outside the Regional GHGMP, and include emissions from electricity associated with unloading, stacking and reclaiming, and ship loading of iron ore.

Scope 3 emissions associated with the iron ore value chain include diesel emissions associated with tugs[3], which berth bulk carriers, the shipping of iron ore to BHP's customers and the emissions associated with the production of steel, using coal to reduce iron ore. Each of these activities is undertaken by third parties.

[2] The NGER Act does not provide a calculation methodology for GHG emissions associated with land clearing. Estimates in this GHGMP have been derived from the Full Carbon Accounting Model (FullCAM), consistent with the National Inventory reporting used by Department of Climate Change, Energy, the Environment and Water (DCCEEW) to determine land use, land use change and forestry (LULUCF) emissions.

[3] Tugboat activities are operated by BHP Towage Services and not BHPIO

Electricity Generation Proposals

Scope 3 emissions for Electricity Generation Proposals are associated with the production and transport of natural gas and diesel (and other upstream processes) outside of the Regional GHGMP Boundary. The latest Scope 3 emission factors are sourced from the Department of Climate Change, Energy, the Environment and Water, National Greenhouse Accounts Factors.

2.1.5 Excluded sources of emissions

The following sources of emissions are currently not included in the scope of the Regional GHGMP:[4]

- There are no sources of Scope 2 emissions associated with the Regional GHGMP as there is no third-party imports of electricity currently or proposed.
- Emissions associated with landfill and wastewater effluent, which are below NGER reporting thresholds.
- Emissions of HFCs and PFCs have been considered as per NGER reporting methods. Annual GHG emissions inventory reporting required by the NGER Act of BHPIO's existing iron ore mining operations continue to validate these categories of GHG to be below reporting thresholds under the NGER scheme or not applicable to iron ore mining. BHPIO's NGER reporting has been and continues to be independently assured to a reasonable assurance level.
- Scope 3 emissions exclusive of those associated with the supply of fuel to the power stations.

2.1.6 Emissions calculation methodology

GHG emissions estimates in this Regional GHGMP have been calculated in accordance with DCCEEW emission factors and methods of the NGER Act and National Greenhouse Accounts, with the exception of land clearing emissions for which the NGER Act does not include a calculation. Consistent with the land-use change emission estimation methods adopted by the Australian Government, BHPIO has derived land-use change emissions using the Full Carbon Accounting Model (FullCAM) methodology, which is consistent with the National Inventory reporting used by DCCEEW to determine land use, land change and forestry (LULUCF) emissions in both National and State emission inventory reporting.

Scope 1 emissions (Mining)

Figure 3 illustrates the steps to determine diesel demand from the operation of mining equipment and dewatering to estimate Scope 1 emissions from mining activity. Summaries below provide further detail on each step, including estimation of emissions from land use change.

Heavy haulage and ancillary equipment - diesel

Diesel consumed by haul trucks and other mining equipment, is derived from estimated equipment hours and work required to support iron ore and waste movements, and OEM fuel consumption rate estimates. These factors are routinely reviewed against business records and by subject matter experts (SMEs).

Other consumers of diesel have been considered and compared to estimates used in BHPIO Business Plans in conjunction with project specific assumptions from relevant SMEs.

[4] BHPIO's operations and regulatory emissions reporting guidance are subject to change, which may influence emission sources considered in the Regional GHGMP in future.

Dewatering - diesel

Emissions associated with diesel use for dewatering infrastructure, have been derived by comparing estimates used in BHPIO Business Plans and project specific assumptions from relevant SMEs.

Land Clearing - LULUCF

Estimating GHG emissions associated with land use (clearing of vegetation) aligned with the FullCAM methodology, the model utilised by DCCEEW for modelling Australia's GHG emissions from the land sector, and for reporting Australia's GHG emissions and State and Territory GHG Inventories.

Scope 1 emissions (Electricity Supply)

Depending on the subject of a Proposal, electricity demand and associated emissions are forecast using different methods. Where electricity generation is the focus of a Proposal, studies predicting BHPIO's future grid-scale electricity demand and electricity production informs emission estimates. Mine development Proposals base electricity demand estimates on their specific electricity demand requirement, which may be limited to ore processing at a specific mining hub.

Power Generation Proposals

Forecasting emissions from power generation is challenging due to the inherent variability of load demand and uncertainty associated with the deployment of emerging emissions reduction technologies.

Electricity emissions are based on modelled electricity demand, factoring BHPIO's mine plans, decarbonisation plans and power generating capacity of existing and proposed infrastructure. Emission intensities and efficiency of existing power generation infrastructure is based on the combination of historical performance and predicted loading, which may influence future emissions intensity. New infrastructure and equipment may rely on OEM performance estimates to derive GHG emission estimates.

Mining Proposal Electricity Demand

Electricity emissions are based of the recent average of BHPIO's NGER Act reported emissions associated with megawatt hours of power generation from Yarnima Power Station per unit of electricity generation. The electricity emissions for each Proposal have been calculated by apportioning estimated electricity demand associated with development scenarios to support iron ore production under this Regional GHGMP.

Scope 1 emissions (Rail Operations)

Rail transport emissions are based on the recent average of BHPIO's NGER Act reported emissions associated with iron ore transport activities. The average emissions per net tonne kilometre to transport iron ore from BHPIO's mines to Port Hedland has been calculated.

For mining Proposals, proposal specific emissions have been calculated by apportioning the saleable production of iron ore and the average emissions per net tonne kilometre to estimate emissions attributable to the Proposals.

GHG emissions associated with rail transport is not relevant or included in power generation Proposals.

BHPIO downstream emissions

GHG emissions associated with BHPIO's downstream activities is relevant and included in mining Proposals; however, is not relevant or included in power generation Proposals.

Emissions associated with diesel and electricity use at BHPIO's Port Hedland operations, supporting iron ore ship loading activities have been estimated by apportioning the NGER Act reported emissions associated with BHPIO's Port Hedland activities required to support the forecasted production from the Proposals under this Regional GHGMP.

Scope 3 emissions

Mining Proposals

Emissions have been estimated based on the most material sources (processing of sold products, and downstream shipping of sold products). We outline below the industry average emission factors and key assumptions used in the calculations. These provide an estimate for material Scope 3 emissions sources, but because they are not customer, shipper or geography-specific, may only approximate the activities taking place within our value chain. Estimates exclude other potential sources of Scope 3 emissions, such as upstream emissions associated with purchased goods and services.

GHG emissions associated with the downstream processing of BHPIO's iron products into steelmaking has been estimated according to the same industry-average emissions factors used at BHP Group level reporting of Scope 3 Category "Processing of Sold Products" emissions in FY2021 (BHP 2022c). GHG emissions relating to steelmaking from processing raw materials associated with the Proposals subject to this Regional GHGMP are estimated using global average emissions intensity factor (tonnes of CO_2 per tonne of crude steel) for the blast furnace to basic oxygen furnace (BF-BOF) process route sourced from the International Energy Agency (IEA). This emissions intensity factor for crude steel is assumed to be attributable to iron ore only and not scrap steel. The emissions intensity factor is applied to an equivalent crude steel production volume assuming 100% of a Proposal's iron ore product is processed using this route (BHP 2022c). The crude steel equivalent is calculated assuming the average annual rate of output for the orebodies that are relevant to each relevant Proposal the subject of this Regional GHGMP and the average percentage iron (Fe) content across BHP's product portfolio in FY2022, converted to equivalent crude steel quantity assuming the global industry average iron content of crude steel (99.1% Fe) from the IEA Iron and Steel CCS Study (April 2013). This estimate does not take into account site-specific production grades or fluctuations in production volumes anticipated from each of the Proposals. This estimate is a straight-line extrapolation of the potential indirect emissions associated with the downstream processing of our iron products, holding all assumptions constant from FY2022. Shipping emissions have been estimated assuming 100% of production from the Proposals will be shipped over a distance reflecting a North Asia dispatch region using an industry average, historical emissions intensity factor per voyage. We assume this emissions intensity factor and distance travelled holds constant across the life of each of the Proposals.

Scope 3 emissions estimates do not contain any forward-looking views on potential emissions abatement measures that may occur in the value-chain that may impact future Scope 3 emissions.

Electricity Generation Proposals

Scope 3 emissions associated with the upstream activities to produce and transport natural gas via pipeline, and diesel for power generation have been estimated sourcing relevant Scope 3 emission factors from DCCEEW's latest National Greenhouse Accounts. There are no downstream sources of Scope 3 emissions.

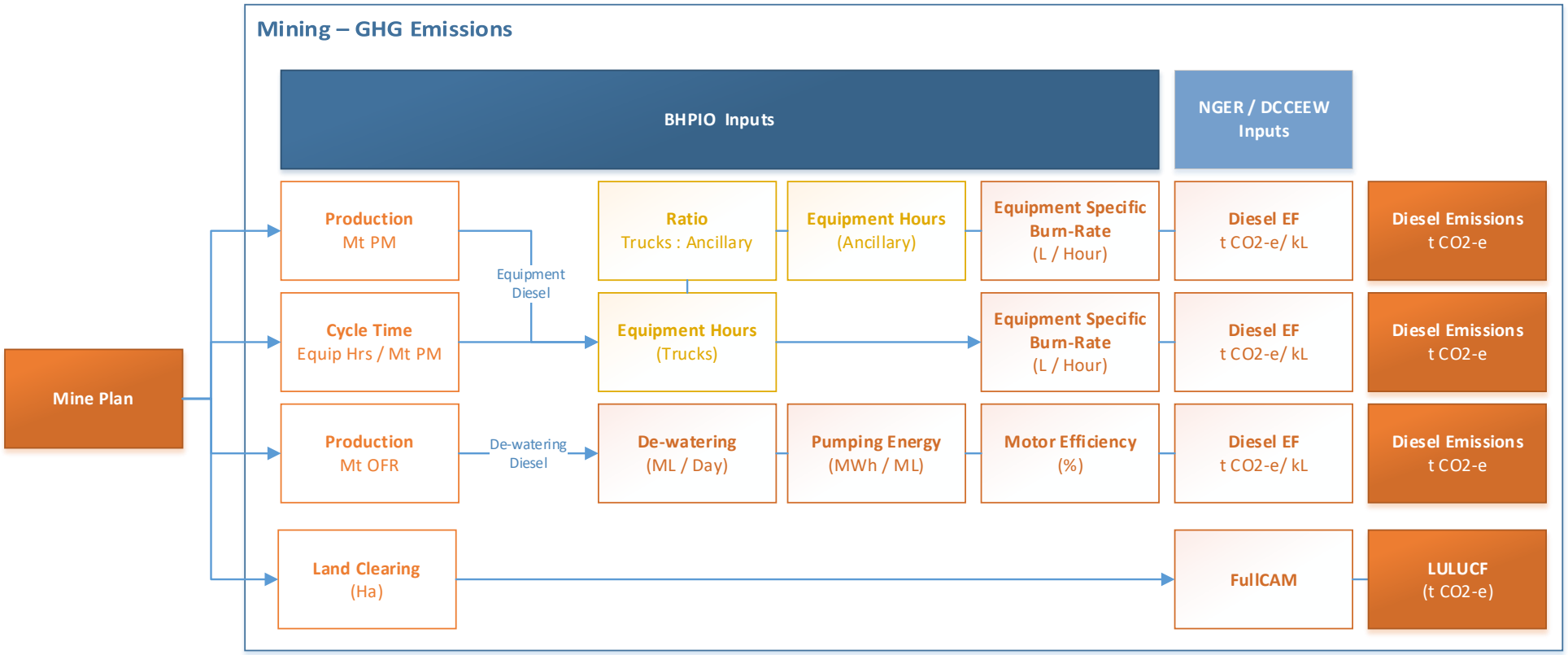


Figure 3: GHG Emissions Forecasting Overview (Mining)

2.1.7 Contribution to State and National GHG Emissions

Table 3 provides a summary of the total national and state emissions, sourced from DCCEEW.

BHPIO compares the estimated average annual emissions for each of the Proposals to recent national and state GHG emissions totals in the Proposal Specific Schedules.

Table 3: National and State GHG Inventory

Emissions Source	2021 Western Australia Emissions ($MtCO_2$-e)	2022 Australian Emissions ($MtCO_2$-e)
Energy	77.38	401.16
Industrial processes and product use	4.90	32.60
Agriculture	10.05	79.24
Waste	1.91	13.62
Land use, land use change and forestry	-14.00	-63.86

2.2 Trajectory of emissions reduction

BHPIO is committed to achieving net zero GHG emissions by 2050. The exact measures to be implemented to achieve net zero GHG emissions remains subject to uncertainty due to the long-time horizon of BHPIO's operations in the Pilbara, changing policy and regulation and the rapid evolution of availability and feasibility of technological solutions. The magnitude and timing of emissions reduction will be subject to a range of factors, some of which are outside the control of BHP, including:

- mine strategy and production may fluctuate in response to changes in the market or operational considerations, which may impact GHG emissions from the Proposals due to changes to forecast mining activities and power demand
- adoption, availability or effectiveness of decarbonisation technologies may change as new technologies emerge, or as complexities of implementation become clearer
- suitable sources of renewable energy may take longer to become available than forecasted, for example through delays in developing suitable regional energy infrastructure
- increased competition for decarbonisation expertise, services and technology may impact speed, effectiveness, or cost of implementation.

Acknowledging these uncertainties, BHPIO aims to adopt indicative emissions reduction trajectories for Scope 1 emissions from the Proposals the subject of this Regional GHGMP, which is aligned with the Safeguard Mechanism. This trajectory will guide emission reductions for BHPIO's operations within the Regional GHGMP Boundary.

Production-adjusted baselines

From 1 July 2023 the Safeguard Mechanism requires all facilities baselines to be 'production-adjusted'. Production adjusted baselines, on a simplistic basis are determined by the function of three components:

1. **Safeguard Mechanism Decline Rate**: Table 4 provides an overview of the decline rate expected to apply to NGER facilities (other than Trade Exposed Baseline Adjusted facilities). Decline rates are subject to periodic review by Government.
2. **Emissions Intensity**: The Safeguard Mechanism is transitioning all facilities towards using the 'default emissions intensity' or 'industry best practice emissions intensity' on an 100% basis from FY2030, when calculating baselines. The relative proportion of site specific emission intensity to industry default emission intensity from FY2024 to FY2030 will vary based on the Safeguard Mechanism:
    a. Default Emissions Intensity: Representative of the Government assessed industry average for the production of specific commodities, including iron ore, electricity and net tonne kilometres of iron ore transported by rail (Table 1 summarised the default emissions intensity applicable to BHPIO's NGER Facilities).
    b. Site-Specific Emissions Intensity: Historic emissions intensity for an NGER facility between FY2018 to FY2022, selecting the mid-point.
    c. Industry Best Practice Emissions Intensity: Continues to be developed by Government, aims to consider international best practice, aligning to local conditions. The Safeguard Mechanism applies the default emissions intensity to new NGER Facilities, which will be superseded by best practice emissions intensities once developed.
3. **Actual Production**: The NGER Act will require companies to report production associated with emissions intensities, in addition to existing requirement for emissions and energy reporting to the CER.

Production-adjusted baselines are determined by the CER once emissions and production data has been reported through the NGER Act, which are due 31 October preceding a financial compliance year. Production-adjusted baselines compensate for the potential for actual production to vary, ensuring that emissions limits remain relative to actual production, limiting issues of discrepancy between estimated production and emissions, and those which occur in practice. As a result, this Regional GHGMP provides an estimate of the applicable baseline, the actual emissions baseline applicable to BHPIO's NGER facilities used to manage Proposals' net emissions is determined annually by the CER and operates as a net GHG emissions limit for that year.

Table 4: Safeguard Mechanism Production Adjusted Baseline Decline Rate

Year	Safeguard Mechanism Decline Rate (%)[5]	
	Cumulative	Annual
FY2024	4.90	4.9
FY2025	9.80	4.9
FY2026	14.70	4.9
FY2027	19.60	4.9
FY2028	24.50	4.9
FY2029	29.40	4.9
FY2030	34.30	4.9
FY2031	37.59	3.285
FY2032	40.87	3.285
FY2033	44.16	3.285
FY2034	47.44	3.285
FY2035	50.73	3.285
FY2036	54.01	3.285
FY2037	57.30	3.285
FY2038	60.58	3.285
FY2039	63.87	3.285
FY2040	67.15	3.285
FY2041	70.44	3.285
FY2042	73.72	3.285
FY2043	77.01	3.285
FY2044	80.29	3.285
FY2045	83.57	3.285
FY2046	86.86	3.285
FY2047	90.14	3.285
FY2048	93.43	3.285
FY2049	96.71	3.285
FY2050[6]	100.00	3.285

[5] Safeguard Mechanism decline rate is sourced from the NGER (Safeguard Mechanism) Rule 2015. Decline rates are subject to change, with DCCEEW indicating that the decline rates for FY2031 to FY2030, subject of 2027 consultation.

[6] FY2050 and beyond Proposals will be net-zero emissions.

2.3 Calculation of indicative emissions reduction trajectory

BHPIO has estimated the indicative emissions reduction trajectory for each of the Proposals the subject of this Regional GHGMP by applying the latest Safeguard Mechanism decline rates to baseline emissions presented further below in Proposal Specific Schedules. Actual emission reductions will vary based on factors, including the initial use of "site-specific emission intensity values" with a gradual transition to the "Schedule 2 – Default Emission Intensities", and recorded production variable outputs. These factors have been described in Section 2.2.

The equation below provides an overview of the determination of the indicative emissions trajectory for each of the mining, power generation and rail operations activities, associated with each of the Proposals.

$$\boldsymbol{Annual\ indicative\ emissions\ trajectory} = \boldsymbol{annual\ baseline\ emissions} \times \left(\frac{\mathbf{100} - \boldsymbol{SGM\ decline\ rate}}{\mathbf{100}}\right)$$

Where:

- 'annual baseline emissions' means the emissions associated with each of the Proposals, estimated in accordance with Section 2.1.6 ; and
- 'SGM decline rate' means the cumulative annual Safeguard Mechanism decline rate, applicable to the relevant year (Table 4).

Indicative emissions reduction trajectories are subject to a range of uncertainties, including:

- mine strategy and production may fluctuate in response to changes in the market or operational considerations, which may impact GHG emissions from mining, rail transport and/ or power generation associated with each Proposal;
- the demand for power from Yarnima (and therefore its GHG emissions) is influenced by mine strategy and production which may fluctuate in response to changes in the market or operational considerations; and
- amendments to the Safeguard Mechanism, which may include change to production variables, relevant production variable emissions intensities (default or industry best practice), and revised annual decline rates. However, any amendments to the Safeguard Mechanism Rule would need to be consistent with the NGER Act objects, notably the 'hard cap' and overarching emissions reduction requirements, as set out in Section 1.4. As such, any future amendments would not depart from outcomes that are aligned with the EPA's objective for GHG emissions.

2.4 Benchmarking assessment

GHG emissions intensity is the measure used to benchmark each of the Proposals subject to this Regional GHGMP and represents the quantity of GHG emissions emitted per unit of production. GHG intensity is calculated as:

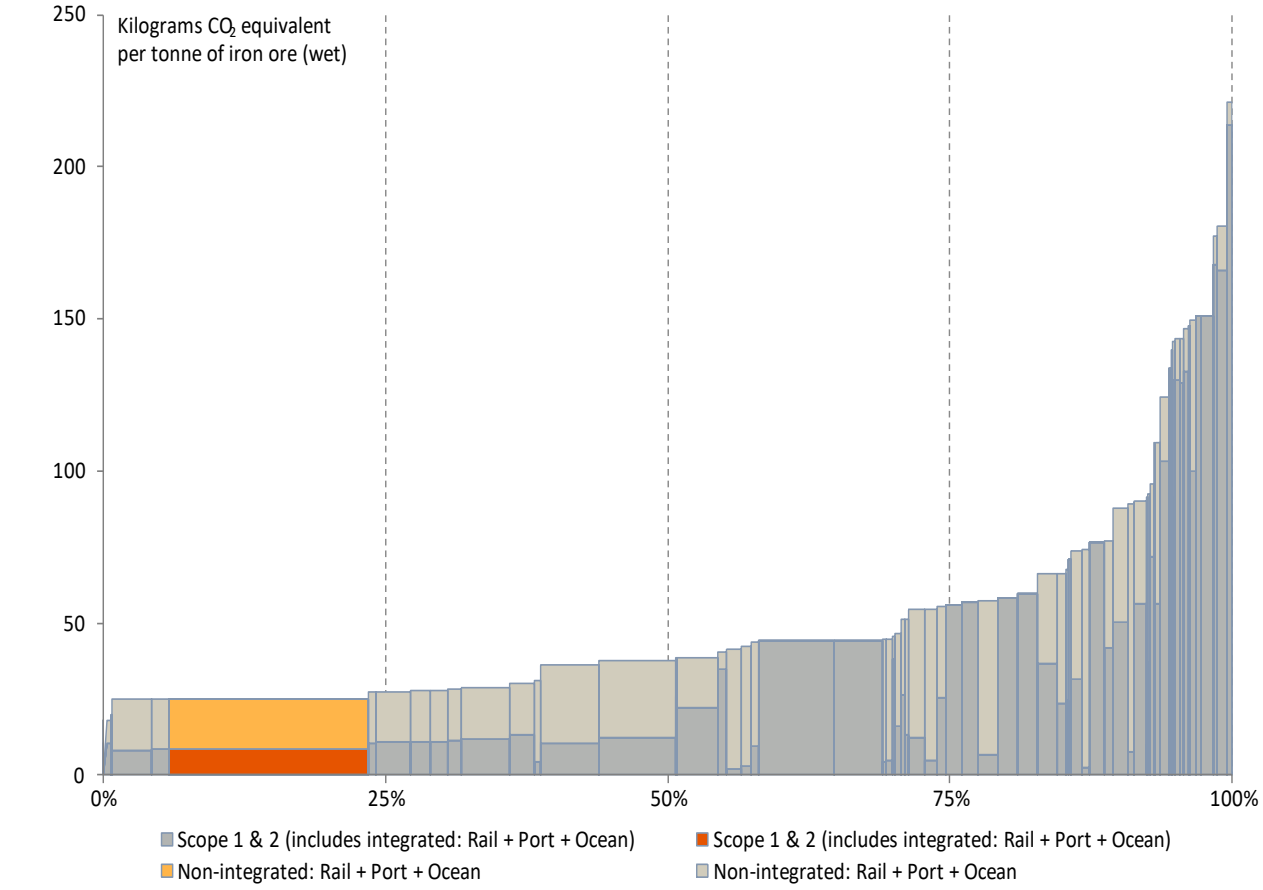
- For the iron ore mining sector, tCO_2-e/t of iron ore, on a wet basis, that is produced and is of a saleable quality, consistent with the Safeguard Mechanism.
- For electricity generation facilities, tCO_2-e/ MWh of electricity produced, consistent with the Safeguard Mechanism.

Industry Benchmarks

BHPIO is estimated to be in the lowest quartile amongst global iron ore competitors, which is how much carbon emitted per units of production. Figure 4 illustrates BHPIO's emissions intensity (Scope 1, Scope 2, and Scope 3) of saleable iron ore production is in the bottom quartile, which is highly influenced by our world class resources, highly efficient gas power generation and proximity to infrastructure. Due to the different structure of various mines to aid comparability and consistency with the Skarn Associates data for the non-BHP mines, we have included select Scope 3 emissions estimates for downstream transport and processing of the commodity, where appropriate.

The iron ore emissions intensity curve is based on CY2021 data estimates from Skarn Associates for seaborne iron ore operations. BHP operations have been aggregated to BHPIO level and overlayed with reported BHP data points for CY2021 for: i) iron ore production (wet basis); ii) Scope 1 emissions; and iii) Scope 2 emissions incorporating integrated rail, port and ocean emissions. Non-integrated port and rail and ocean emissions intensity estimates utilise Skarn Associates data across the dataset. In case of BHPIO, only the emissions from non-integrated Ocean freight are applicable as rail and port emissions are included as part of Scopes 1 and 2 emissions.

The emissions intensity of each of the Proposals the subject of this Regional GHGMP includes, as relevant, BHPIO's Scope 1 emissions from mining, rail and power generation activities. As the scope of this Regional GHGMP excludes port activities and other operators may include shipping within their Scope 1 estimates (e.g. Vale), it is challenging to compare sub-sets of the overall emissions intensity (Scope 1, Scope 2 and Scope 3) of various iron ore producers, represented in Figure 4 accurately.



* Source: Skarn Associates, BHP

Figure 4: 2021 Carbon Intensity – Seaborne Iron Ore[7] (BHP 2022c)

Safeguard Mechanism – Schedule 2 (default emissions intensity)

Mining Proposals

The Safeguard Mechanism 'default' emissions intensity for iron ore mining is 0.00476 tCO_2-e/t iron ore, which represents the Australian industry average Scope 1 emissions of iron ore production. The default emissions intensity was determined by the DCCEEW based on reported Scope 1 emissions and iron ore production over the five-year period FY2013 to FY2017.

These default emissions intensities are published in Schedule 2 of the Safeguard Mechanism Rule (*NGER Regulations (Safeguard Mechanism) Rule* 2015). The iron ore mining default emissions intensity includes all Scope 1 NGER-reported facility emissions, excluding on-site electricity generation and processes that do not occur within the NGER facility, such as rail transport.

[7] The iron ore emissions intensity curve is based on CY2021 data estimates from Skarn Associates for seaborne iron ore operations. The emissions intensity basis is kilograms of CO2-equivalent per tonne of iron ore (wet basis) produced per mine. BHP operations have been aggregated to WAIO level and overlayed with reported BHP data points for CY2021 for: i) iron ore production (wet basis); ii) Scope 1 emissions; and iii) Scope 2 emissions incorporating integrated rail, port and ocean emissions. Non-integrated port + rail + ocean emissions intensity estimates utilise Skarn Associates data across the dataset. In case of WAIO, only the emissions from non-integrated Ocean freight are applicable as rail and port emissions are included as part of Scopes 1 and 2 emissions.

Electricity Generation Proposals

The Safeguard Mechanism 'default' emissions intensity for electricity generation, which represents the Australian industry average Scope 1 emissions of for electricity generation is 0.539 tCO_2-e per MWh of electricity exported. These default emission intensities are published in Schedule 2 of the Safeguard Mechanism Rule (*NGER Regulations (Safeguard Mechanism) Rule* 2015).

BHPIO compares the Safeguard Mechanism's 'default' emissions intensity, relevant industry benchmarks and the Australian average of 0.65 tCO_2-e / MWh (published by DCCEEW in the 2023 National Greenhouse Accounts) to the average emissions intensity for Scope 1 emissions associated with the Proposals the subject of this Regional GHGMP.

2.5 Scope 1 Mitigation Measures

GHG emissions abatement opportunities for each of the Proposals the subject of this Regional GHGMP have been assessed by BHPIO to determine whether they are reasonable and practicable against multiple criteria including safety, technical performance, operability, emissions reduction, availability, scale, and economic viability. Section 4 describes how BHPIO will continue to review and update the Regional GHGMP to consider all reasonable and practical measures to reduce Scope 1 emissions associated with each of the Proposals.

There is potential for substantial changes in GHG policies, markets, technology, and regional energy infrastructure over the lifetime of BHPIO's operations in the Pilbara. This may provide opportunities to accelerate adoption of GHG abatement measures or influence the reasonableness or practicability of GHG abatement measures.

2.5.1 Operational decarbonisation strategy

BHP manages its operational decarbonisation program on an enterprise-wide basis, reflecting the global nature of climate change and the opportunities for implementation of decarbonisation technologies across multiple sites. Through studies and a capital allocation process, BHP seeks to optimise the risk and reward proposition for operational decarbonisation projects and optimise decarbonisation at a portfolio level. BHP has developed an internal marginal abatement cost curve designed to support identification of the most efficient and effective decarbonisation projects. Further information regarding BHP climate change strategy and commitments is available in the BHP Climate Change Report 2020 and BHP Climate Transition Action Plan 2021.

BHP has recognised the importance of taking action on climate change for decades and continues to evolve strategies to reduce its potential contribution to climate change as our collective understanding of the long-term risks evolve. For GHG emissions (Scope 1 and Scope 2 from our operated assets), BHP has:

- a long-term goal to achieve net zero operational GHG emissions by 2050; and
- a medium-term target to reduce operational GHG emissions by at least 30% from FY2020 levels by FY2030 (BHP 2021).

Each of BHP's operated assets have decarbonisation plans in place to FY2050 that collectively support the medium-term target and long-term goal for operational emissions reduction, including BHPIO's decarbonisation plan for the operations within the Regional GHGMP Boundary. These plans are prioritised at the global level in accordance with BHP's capital allocation framework, coordinated at the regional (Minerals Australia) level and executed at the asset (BHPIO) level. Figure 5 illustrates the

consistency between BHP's operational decarbonisation strategy and its interim and long-term decarbonisation targets, the Safeguard Mechanism which is used to determine the indicative emissions trajectories of the Proposals the subject of this Regional GHGMP.

BHP applies the mitigation hierarchy of avoid, reduce, offset for GHG emissions at all levels from site level to global level. While BHP prioritises structural emissions reductions over carbon offsets, BHP expects offsets to play a role in our transition towards net zero, while structural solutions are under development, or to address 'hard to abate' emissions. This mitigation hierarchy is applied in BHPIO's management of GHG emissions from each of the Proposals within the Regional GHGMP Boundary.

BHP implements measures to continuously improve and reduce energy use and emissions, including building capability and capacity to enhance climate change mitigation, delivered through organisational design and business standards. BHP's Environment and Climate Change: Our Requirements (BHP 2020b), sets BHP's expectations for management of climate change from current and future operations, and includes identification of opportunities annually (for e.g. new project, incremental improvement and/or equipment selection) for GHG emissions reductions to:

- calculate the return on investment using the applicable carbon price forecast (available internally)
- get approval for the opportunities with a neutral or positive return on investment (unless opportunities are unsuitable) and implement by including in business plans
- monitor and review implemented opportunities and quantify the reductions in GHG emissions.

Additionally, climate change impacts and mitigation measures are considerations in BHP's Sustainability in Design standards which apply to major projects, including projects within the Proposals the subject of this Regional GHGMP. Considerations such as carbon capture and storage technologies, energy conservation, reduction of hydrocarbon consumption, use of local sources of materials and use of renewable energy are included in the Sustainability in Design Standard.

These measures are applied in BHPIO's management of GHG emissions from the Proposals within the Regional GHGMP Boundary.

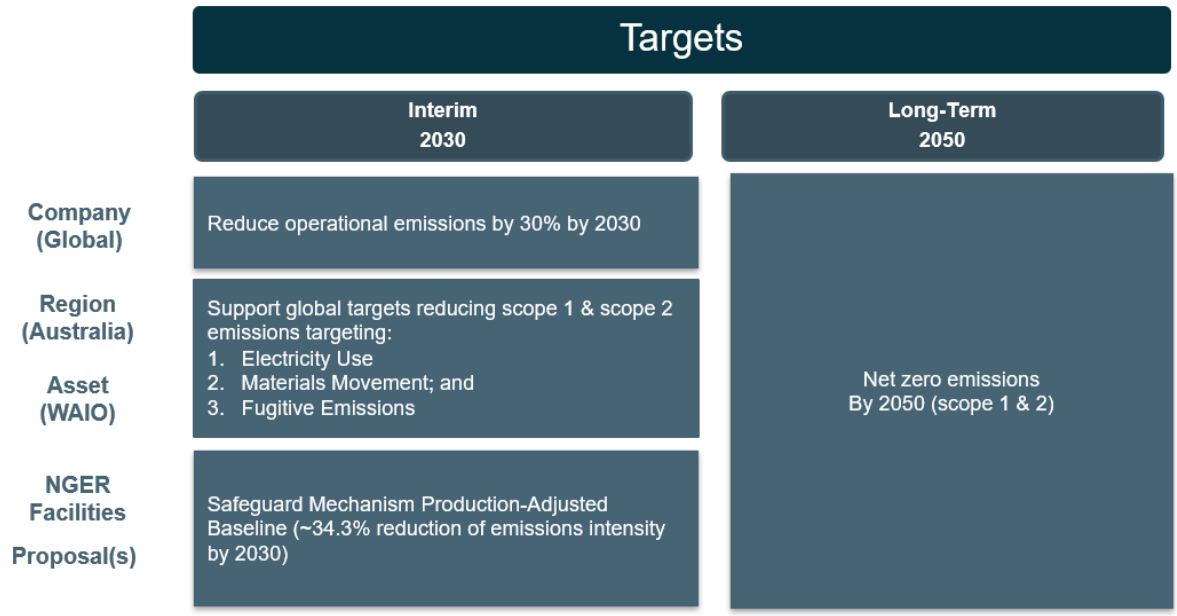


Figure 5: Current emissions targets, monitoring and reporting mechanism

2.5.2 Strategies to avoid and reduce Scope 1 emissions

Operational decarbonisation opportunities are managed at the asset level (i.e. across BHPIO's operations in the Pilbara region). This is consistent with the regional management approach set out by this Regional GHGMP, which allows for coordination and consistency across BHPIO's iron ore operations in the Pilbara.

BHPIO currently has the below operational emissions profile for its existing operations within the Pilbara. Generally, with the exception of emissions from purchased electricity at Port Hedland, the material sources of emissions from diesel and natural gas fall within the Regional GHGMP Boundary. Although Port Hedland emissions are not a relevant source of Scope 1 emissions to the Proposals, they are considered as a downstream source of emissions for mining Proposals. The full extent of BHPIO's Pilbara emissions represented below, illustrates the relative potential of Scope 1 and downstream emissions mitigation strategies detailed in this Regional GHGMP to reduce BHPIO's total emissions by approximately[8]:

- 10% from purchased electricity to power BHPIO's operations at Port Hedland (outside of the Regional GHGMP Boundary).
- 15% from electricity supplied from Yarnima, a combined cycle gas-fired power generation plant operated by BHPIO, that serves an islanded network supplying power BHPIO's iron ore mining operations in the Pilbara.
- 75% from diesel used to power truck and locomotive fleets and fixed plant equipment.

BHP's decarbonisation strategy for the Proposals the subject of this Regional GHGMP focuses on reducing emissions through two focus areas: increasing the availability of renewable power; and rail and fleet electrification. Electrification of rail and fleet is relevant to the reduction of Scope 1 emissions over time.

When considering abatement initiatives to meet operational emission medium-term target and long-term goals, BHP considers a range of metrics including carbon price forecasts, the position of initiatives on BHP's internal marginal abatement project cost curve, technology maturity and ultimate abatement potential.

As part of BHP's capital allocation process, decarbonisation plans will be reviewed annually. This review will consider studies of potential decarbonisation initiatives conducted by BHP or others to assess the technology readiness, abatement efficiency, ease of operational integration and other relevant factors. This informs the implied costs and benefits of our decarbonisation initiatives and allows BHP to prioritise and rank those initiatives in the context of the Proposals.

Fleet decarbonisation (mining and rail)

Haul trucks

Material movement by heavy mining equipment powered by diesel makes up approximately half of the existing emissions profile across BHPIO. Diesel displacement represents the largest technical challenge to decarbonisation and BHP has considered available technologies for diesel replacement and identified the preferred pathway of eliminating diesel is through electrification (BHP 2023). This includes through partnerships with original equipment manufacturers to develop electrified haul trucks,

[8] BHPIO's operational emission proportions are approximate and aligned with FY2023 reported emissions.

and collaboration in industry initiatives aimed at developing concepts for large-scale haul truck electrification and charging systems.

BHP has partnered with Caterpillar and Komatsu to develop commercially viable zero emissions trucks. Early prototypes have been developed by both Caterpillar and Komatsu through this collaboration (BHP 2023). Trials at operations within the Regional GHGMP Boundary are planned to begin in 2024 with commercial release expected to follow in the following five years (BHP 2023). While it is not yet possible to be definitive on timelines, the first electric haul trucks are expected to be operational on selected BHPIO sites by 2027 and all trucks are planned to be electric by the mid-2030s (BHP 2023).

Studies of electric fleet at BHP will contribute to these industry initiatives. Implementation is intended to be in line with any industry standards set.

Charging Infrastructure

Replacing diesel as a fuel source requires a new operational ecosystem, impacting mine planning, haulage networks, and reconsideration of safety and operational factors. BHP is part of the Charge on Challenge, an initiative that has identified potential innovations to expedite the commercialisation of charging solutions for electric haul trucks. In FY2022, BHP became a founding member of the mining taskforce at CHARIN, an association dedicated to promoting interoperability of charging systems. The taskforce's aim will be to make sure any truck charging interfaces across the industry will be standard, regardless of the manufacturer.

For static charging, BHP is working through the Charging Interface Initiative Mining Taskforce, with over 60 other mining companies and vendors, to develop a standard so equipment will charge with the same connectors.

For dynamic charging, conventional trolley assist technology is available today, but implementation is difficult, because as the areas mined change the infrastructure will need to be moved. BHP is supporting one of the Charge on Innovation Challenge participants – BluVein – who are developing side mount dynamic charging systems to improve both mobility and cost effectiveness (BHP 2023).

To better understand how these systems will interact, BHPIO has completed extensive modelling of charging infrastructure within our operations, including operations within the Proposal (BHP 2023). This modelling is helping BHPIO better understand the economics, trade-offs and limitations of the technologies for use within the context of the Proposals.

Excavators

The development of electric excavators is more advanced than electric haul trucks but BHPIO recognises that there is learning to be done in the application of this technology in operations. In 2024, one of BHPIO's Pilbara iron ore operations will receive a Liebherr 9400 electric excavator, one of the first in Australia, and BHPIO will commence a working trial (BHP 2023). Upon completion of successful trials, BHP is targeting deployment of electric excavators from 2027 (BHP 2023).

Light vehicles

BHP has also partnered with Toyota Australia to trial a new light electric vehicle at a site in Western Australia and BHPIO plans to eventually replace its diesel light vehicles with electric light vehicles at across its Pilbara iron ore operations. Once implemented, electric light vehicles will play a part in reducing the emissions that arise from diesel as a fuel source.

Locomotives

Combustion of diesel by the rail network contributed approximately 20% of BHPIO's operational emissions in FY2022. In January 2023, BHPIO signed partnership agreements with two locomotive manufacturers, Wabtec and Progress Rail, to develop battery electric locomotives. Prototypes have already been developed by these manufacturers (BHP 2023).

Trials of two locomotives from Wabtec and two locomotives from Progress Rail are due to commence in 2024, with the first battery-electric truck sites and loco consists operating by the late 2020s. Battery electric locomotives have the potential to reduce emissions across BHPIO's operations by 20% if fully implemented.

Impact of fleet decarbonisation in the Regional GHGMP

As Scope 1 emissions of the Proposals within the Regional GHGMP Boundary are predominantly associated with the combustion of diesel, once electric fleet begins to be implemented, a sharp and substantial decrease in Scope 1 GHG emissions for each Proposal is anticipated.

Electricity Generation

High efficiency thermal generation and waste heat recovery

Electricity for BHPIO's Pilbara operations is primarily supplied by Yarnima, a highly efficient combined cycle gas turbine power station which produces electricity at an average emissions intensity of 0.44 kg CO_2-e per kilowatt hour, compared to the Australian production average of 0.65 kg CO_2-e per kilowatt hour and 0.53 kg CO_2-e per kilowatt hour for the South-West Interconnected System (National Greenhouse Accounts Factors 2023, DCCEEW).

A key factor in Yarnima's efficiency, which emits approximately 35% less CO_2 than the Australian average, is the integration of waste heat recovery to generate additional power, reducing the overall emissions intensity. Yarnima's high efficiency has contributed in part to a reduction in the emissions intensity of iron ore production at BHPIO operations from an average of 9.2 tCO_2-e/kt of ore between 2014 to 2018 to an average of 8.5 tCO_2-e/kt of ore between 2018 and 2022.

Renewable electricity

Decarbonising electricity by integrating renewables at BHPIO is a priority this decade. The transition to greater renewable supply is planned to begin with proven renewable technology such as wind and solar farms. BHP is presently studying potential pathways for creation or acquisition of the required increase in power from these renewable sources.

As BHP moves to displace diesel with electricity, an estimated further 900MW of power will be required to support operations at BHPIO by 2040. BHP plans to primarily source that additional power from renewable sources (BHP 2022b).

BHP will seek to increase renewable energy penetration within the network to achieve net zero GHG emissions for the asset by 2050. BHPIO is planning for up to 500MW additional renewable generation and storage capacity within the area of the Regional GHGMP Boundary to be installed by 2030 (BHP 2023). This will be completed in a staged approach, and over the decade, BHP anticipates having up to 200MW of power generated by wind, 200MW of power generated by solar and 150MW of battery energy storage. BHPIO has already completed solar resource assessments on sites within the Regional GHGMP Boundary to understand its potential and is presently undertaking wind assessments and surveys on sites within the Regional GHGMP Boundary.

As part of the staged approach, BHPIO has evaluated scenarios for renewable energy generation, considering evolving load forecasts, influenced by factors including the pace of development of fleet decarbonisation technologies and opportunities for energy generation within BHPIO's islanded transmission network and/ or potential for common-use infrastructure within the Pilbara.

To match the scale and pace of development required, BHPIO is evaluating the installation of solar, wind and battery infrastructure on sites near BHPIO's current operations (**On-Tenure Option**) and connecting to remote renewable energy generation facilities (**Off-Tenure Option**). In respect of the On-Tenure Option, BHP is optimising technical studies to identify locations which may be suitable for solar, wind and battery infrastructure, including desktop and in-field assessments, refining the optimal mix of these technologies and the optimal capacity of each facility.

BHP is in the process of engaging with potential strategic partners for both On-Tenure and Off-Tenure Options, and BHP is assessing associated transmission infrastructure requirements. These options are intended to supply renewable energy to BHPIO operations to meet the scheduled fleet electrification ramp up from 2027 (BHP 2023).

Acknowledging that there will be exponential growth in renewable power infrastructure in the Pilbara, BHP also has an ambition to collaborate with power producers and other power users in the Pilbara to develop interconnectivity with broader networks in the Pilbara. This will ensure the ongoing supply of reliable and affordable energy to our mining operations and our local communities (BHP 2023).

Longer term, BHPIO plans to replace the power supplied from Yarnima with renewable sources to meet the goal of net zero emissions by 2050. Alternative renewable and long-duration storage options are currently being investigated and are expected to be implemented as technology advances. However, substantial near-term increases in electricity generation, improved grid stability and increased energy storage will be required to transition to high penetration renewable energy.

As the proportion of renewable power available to the Pilbara network grows, Scope 1 emissions from electricity generated by Yarnima will decrease as renewable technologies displace thermal generation provided by the Yarnima, during periods of high renewable power generation.

Best Practice Design

Decarbonisation projects are incorporated into BHP's annual corporate planning process and are considered by new developments through the application of internal sustainability and financial controls. These frameworks are designed to evaluate the mitigation hierarchy for BHP's existing operations and ensure that avoiding and reducing emissions is a key consideration for new projects.

BHPIO's decarbonisation plans for the Proposals the subject of this Regional GHGMP contain a pipeline of emissions reduction projects and initiatives that collectively support decarbonisation of direct emissions (Scope 1), on a trajectory to net zero by 2050. BHP has progressed early-stage projects designed to reduce operational emissions and continues to evaluate how a range of developed and emerging zero and low emissions technologies may be integrated into our operations.

The majority of emissions within the Regional GHGMP Boundary are associated with diesel used by heavy mining equipment and locomotives. We recognise the essential role of OEMs in the development of emerging technologies, bringing their expertise and know-how to help solve for the emissions challenge. BHP will continue to collaborate with industry peers and OEMs to assess zero emissions material movement options and determine how they can be deployed for the Proposals.

In addition, BHP's Sustainability in Design Standard described in Section 2.5.1 will ensure that climate change mitigation measures are considered in every major project design.

2.6 Scope 2 Mitigation Measures

There are currently no Scope 2 emissions associated with the Proposals (or future Proposals) the subject of this Regional GHGMP as all electricity supply is generated by BHPIO within the Regional GHGMP Boundary.

Measures to reduce emissions associated with electricity are described in Section 2.5.2 (within the Regional GHGMP boundary) and Section 2.7.1 (outside of the Regional GHGMP boundary, i.e. downstream and Scope 3 emissions).

2.7 Scope 3 mitigation measures

BHP is pursuing the long-term goal of net zero Scope 3 GHG emissions by 2050. Achievement of this goal is uncertain, particularly given the challenges of a net zero pathway for our customers in steelmaking, and we cannot ensure the outcome alone. Due to the hard to abate emissions sources outlined below in steelmaking and shipping and the need to develop new low GHG emissions technology pathways, material decarbonisation opportunities in these sectors will take time to realise.

Scope 3 decarbonisation opportunities are managed primarily at the Group level by the functions of BHP's business with the technical expertise, accountability for decision making, and the greatest ability to influence segments of our value chain. BHP's global marketing team partners with our downstream customers in steelmaking on decarbonisation studies and pilots and ore quality trials, the maritime team works to reduce the emissions intensity of shipping, and the procurement team engages with suppliers to increase the proportion targeting net zero for their operational emissions by 2050. The Scope 3 emissions and mitigation measures for the Proposals the subject of this Regional GHGMP will be managed by these functions as part of the whole-of-company approach to Scope 3.

An exception to this approach is the downstream emissions which are the operational emissions of other BHPIO controlled facilities, such as Port Hedland. These will be managed through BHPIO's operational decarbonisation strategies described in Section 2.5.1 of this Regional GHGMP and specific initiatives described in Section 2.7.1.

2.7.1 BHPIO's Downstream Emissions

Decarbonisation of purchased electricity at Port Hedland

In September 2022, BHP signed a Power Purchase Agreement with Alinta Energy Pty Ltd (Alinta) to purchase 100% of the energy produced by a solar farm that will be constructed near Port Hedland and which will be operational by the end of 2024. This solar battery hybrid project is expected to be the first large-scale renewable facility at Port Hedland and once completed, will supply 100% of the forecast average daytime energy requirements at Port Hedland. BHP has also entered into a memorandum of understanding with Alinta in relation for the Shay Gap Wind Farm, with a potential first-generation date of 2027.

Emissions associated with purchased electricity at Port Hedland represent approximately 10% of BHPIO's current total operational emissions (Scope 1 and Scope 2). These emissions are considered downstream of the Regional GHGMP area as the generation of electricity and BHPIO's operations in

Port Hedland, which consume the electricity resides outside of the Regional GHGMP Boundary. The 2024 Power Purchase Agreement with Alinta is estimated to reduce these downstream emissions by approximately 50%.

2.7.2 Measures to support decarbonisation of steel production

The most material contribution to Scope 3 emissions associated with Proposals the subject of this Regional GHGMP is expected to be the processing of iron ore in steelmaking by customers. In FY2022 use of iron ore and metallurgical coal in steelmaking was more than 80% of BHP's reported Scope 3 emissions and forms a much greater share of BHP's Scope 3 emissions. Steel is anticipated to play an important role in decarbonising economies. It will be required for the infrastructure to support urban growth, industrial transformation, and the deployment of electric transport at global scale. The challenge for steelmaking is to produce this vital commodity to enable sustainable growth, while reducing the emissions footprint of the production process itself.

About 70% of global steel production is currently produced within the BF-BOF steelmaking process (Worldsteel 2023). This process uses metallurgical coal (as coke) for its thermal, chemical and mechanical properties, and natural gas, oil or energy coal for high temperature heating. In these applications, fossil fuels are difficult to displace (hard-to-abate). Steelmaking assets are also expensive to construct and have a long life, so opportunities for substantial decarbonisation exist primarily in two timeframes: when a new asset is built, or when an asset undergoes major refurbishment, which typically occurs about 15 to 20 years into its operational life. To decarbonise, this industry will need to both optimise existing assets and invest in emerging opportunities to produce steel with lower GHG emissions intensity through different potential technology pathways.

The majority of global steel production currently occurs in China (OECD 2023) and China and India are key geographical markets for BHP. Through its Nationally Determined Contribution (NDC) China has a target to reach peak CO_2 emissions by 2030 and achieve carbon neutrality by 2060 (People's Republic of China 2022). China has also made additional commitments by 2030, such as reducing CO_2 emissions per unit of GDP by over 65% (on a 2005 base year), increasing non-fossil energy by 25%, and increasing total wind and solar capacity to 1.2 billion kilowatts (People's Republic of China 2021a).

These ambitions are supported by two documents that outline the strategic plan to achieve China's targets across the economy, the *Working Guidance for Carbon Dioxide Peaking* (People's Republic of China 2021a) and *Carbon Neutrality and Action Plan for Carbon Dioxide Peaking Before 2030* (People's Republic of China 2021b). Guidance in the former document that relates to the Chinese iron and steel industry includes:

- Optimising and upgrading industrial structure. This includes plans to create implementation plans for specific industries, including steelmaking, and accelerate innovation in low-carbon technologies
- Firmly curbing irrational expansion of energy-intensive and high-emission projects, such as limiting capacity of steel production
- Vigorously developing green and low-carbon industries, including 'new energy' and other emerging technologies
- Enhancing monitoring capabilities, such as improving systems for measuring energy consumption and emissions in steelmaking activities.

The Chinese *Action Plan for Carbon Dioxide Peaking Before 2030* contains ten actions to reach peak CO_2 emissions, and includes the following strategic steps to reduce emissions from steelmaking:

- To implement mature energy efficiency technologies in the steelmaking industry
- Encourage substitution of clean energy
- Support trials of developing technologies, that is, alternatives to blast furnace steel production such as hydrogen metallurgy
- Improve recycling and reuse of scrap steel
- Advance the application of electric furnace technology, fed by steel scrap.

China's national emissions trading scheme, which currently covers power generation, is anticipated to be extended to their domestic steel sector within the next one to two years (China Dialogue 2022). In the early years of its operation, China's national ETS has allocated a share of free permits to covered entities in the power sector based on emissions intensity (World Bank 2021) but how this will be applied to the steel sector is currently uncertain.

India submitted its updated NDCs to the UNFCCC in August 2022: to reduce emissions intensity by 45% below 2005 levels by 2030, and to increase the share of non-fossil power capacity to 50% by 2030 and achieve net zero emissions by 2070 (Government of India 2022).

The iron and steel industry in India is covered under the Environment Protection Act (EPA) and Environment Protection Rules & Regulations enacted & published by Ministry of Environment & Forest (MoEF&CC). Initiatives to reduce emissions in the sector include (Government of India 2023):

- The National Steel Policy, launched in 2017 by the Ministry of Steel. This policy includes targets to improve energy efficiency, which are adopted through the Government of India's Perform, Achieve, and Trade scheme
- The Steel Scrap Recycling Policy (2019) is aimed at increasing the utilisation of steel scrap
- Charter on Corporate Responsibility for Environment Protection (CREP). An initiative of the Indian government and major steel producers to improve environmental performance such as limiting pollution, water consumption, and energy consumption. A National Task Force has been established to implement the recommendations of CREP
- Implementation of United Nations Development Programme (UNDP) projects ("Energy efficiency in steel re-rolling mills" and "Up-scaling energy efficient production in small-scale steel industry in India"). Two UNDP projects have been successfully rolled out.

India does not have a direct price on carbon but has several policy measures which levy an indirect price such as fuel levies (OECD 2022).

We recognise the need to work with the industry to support its decarbonisation and we are collaborating with several of our customers to conduct feasibility studies and pilot scale trials. As of FY2022, BHP had committed US$75 million into steel decarbonisation partnerships. These partnerships are with companies representing approximately 12% of reported global steel production capacity, covering 31% of our direct sales in iron ore in FY2022. More information about our partnerships with the steel sector, along with our activities to support decarbonisation in the shipping of our products, can be found in BHP's Annual Report 2022.

2.7.3 Measures to support decarbonisation of shipping

BHP is one of the world's largest dry bulk charterers and we aim to use our chartering size and scale to increase the speed of the shipping industry's progress towards decarbonisation. We seek to influence the supply chain and broader market by creating demand for low and zero GHG emission fuels and energy efficient technologies in shipping.

Vessel propulsion is still primarily powered by the combustion of fuel oil. The long distances travelled, need for suitable port infrastructure, long life of vessels, safety concerns, and nascent alternative fuel options contribute to making this a hard-to-abate sector. As a large shipping customer, we play a number of important roles, including to:

- Create demand for low and zero GHG emissions fuels, such as ammonia, which assists to accelerate the adoption of technologies once proven and provide suppliers confidence to make investment decisions.
- Partner to bring new vessel propulsion technologies to maturity to reduce or eliminate the use of bunker fuel.
- Advocate for industry regulations to increase the speed and scale of shipping decarbonisation.
- Use real-time data analytics to optimise vessel and route selection to improve efficiency.

We collaborate with industry organisations (such as the International Council on Mining and Metals) on decarbonisation frameworks and reporting standards. We joined the First Movers Coalition as a Founding Member in the shipping sector, on the basis of committing that 10% of BHP's products shipped to our customers, on our time charter vessels, will be on vessels using zero emissions fuels by 2030, subject to the availability of technology, supply, safety standards, and the establishment of reasonable thresholds for price premiums.

2.8 Offsets

BHP prioritises GHG emissions reduction at its operated assets to achieve our Scope 1 and 2 targets and goals, with investments in external carbon offset projects considered complementary to this 'structural abatement'.

The GHG emission reduction trajectory for each Proposal the subject of this Regional GHGMP aligns to the recently reformed Safeguard Mechanism. The reformed Safeguard Mechanism allows for a range of flexible compliance arrangements, including the generation of SMCs when emissions are below baselines (and which can be banked or traded within safeguard facilities), the purchase and surrender of ACCUs to reduce net emissions.

Although we prioritise internal emissions reduction at the facility (or facilities) that are within the Regional GHGMP Boundary, we acknowledge a role for the use the flexible compliance arrangements are allowed under the reformed Safeguard Mechanism.

This means that where structural abatement of emissions is insufficient to meet each Proposal's emission reduction trajectory, BHP will ensure that these targets are met by either using banked SMCs from prior years, transferring SMCs from other BHP facilities (to allow decarbonisation to be optimised across BHPIO, for example displacing diesel trucks progressively by mine, rather than a smaller proportion of trucks at all mines in parallel), and/or retiring eligible, high-quality offsets in a temporary

or transitional capacity while abatement options are being studied, as well as for 'hard to abate' emissions with limited or no current technological solutions, and where access to renewable energy is constrained.

We mitigate the risk of offsets being unavailable at the proposed time of surrender by building a portfolio of offsets using a variety of short-term and long-term sourcing approaches, including (but not limited to):

- Spot markets
- Forward or long-term offtakes with guaranteed supplies upon project delivery
- Pre-payment for future guaranteed supplies
- Project origination, both within and outside of BHP's tenure.

Offsets will be sourced, held and retired from the portfolio as needed to meet the anticipated demand for offsets over time, as we work to decarbonise our business. The specific volumes sourced from each approach will be responsive to the prevailing offset landscape, both domestically and internationally (if the use of internationally sourced credits is allowed under the Safeguard Mechanism in the future, given the implementation of Article 6.4 of the Paris Agreement (A6.4 of PA)), to ensure we have continued access to security of supplies.

In the context of BHPIO's operations in Western Australia, including within the Regional GHGMP Boundary, our preference is to source offsets in line with our operational footprint in Western Australia and in recognition of the WA state government's preference for locally generated offsets. We may also source offsets from international markets, in accordance with EPA guidance on the use of offsets within WA, if the use of international credits to meet Safeguard Mechanism obligations becomes allowed in the future, given the implementation of A6.4 of PA. Domestic sourcing of offsets may be from the domestic market or through offset generation from BHP's tenure or other locations in WA, in partnership with reputable project developers under ERF methodologies. BHP is currently undertaking an opportunity assessment to better understand the potential to generate offsets on our tenure (including mineral carbonation and natural climate solutions), as well as exploring opportunities outside of our tenure with project developers in WA.

Considering the types of offsets that are currently available on the market (i.e. predominantly avoidance type) and the value in mobilising carbon finance to incentivise offset supply, we source offsets from solutions that remove atmospheric carbon as well as avoid emissions where these have high integrity, with a planned shift towards removal offsets over time. Whilst we prioritise the acquisition of offsets from nature-based solutions that deliver long-term environmental, social and economic value (i.e. sustainability co-benefits) we also consider the sourcing of offsets from engineered solutions (BHP, 2022). The specific offset types sourced and used within the WA context and for the Proposals the subject of this Regional GHGMP, will depend on the acceptable offset criteria set by the WA EPA, the prevailing market dynamics and the availability and accessibility of offsets.

BHP's procurement of carbon credits, includes due diligence to ensure that we invest in carbon offsets that meet the following minimum quality standards:

- Satisfies national carbon offset standards for compliance offsets (i.e. Australian Carbon Credit Units and other eligible regulatory offset instruments), including ACCUs that are established under (and meet the integrity standards of) the Carbon Credits (Carbon Farming Initiative) Act 2011 (Cth) and/or Registered in an internationally recognised standard that independently verifies and issues voluntary carbon credits (including but not limited to Verra and Gold

Standard) that is accredited by and compliant to the International Carbon Reduction & Offset Alliance (ICROA) Code of Best Practice.

- Adheres to a robust emissions reduction accounting methodology, to provide assurance of the volume of emissions reduced through a project.
- Meets additionality criteria to ensure that the emissions reduction would not have occurred in the absence of a carbon offset market.
- Has a high likelihood of permanence to ensure that the emissions reduction is ongoing and not reversed (e.g. in the case of forestry projects, the trees are not cut down or destroyed by a natural disaster).
- Provides robust mitigation against leakage, ensuring an offsetting project does not increase emissions elsewhere (e.g. an area is protected from deforestation through offsetting but another forest area is destroyed).
- Demonstrates high environmental and social integrity, ensuring no broader social or environmental harm (e.g. hydropower projects that require forest clearing and community displacement).
- Limit offset vintage to the last five years of offset generation, to avoid claiming emissions reduction from activities that occurred a long time ago.

We regularly review our minimum sourcing standards and sourcing strategy to ensure alignment with global best practice, including the outcomes of initiatives such as The Integrity Council for the Voluntary Carbon Market's (IC-VCM) Core Carbon Principles and the Chubb review into the integrity of ACCUs (DCCEEW 2022).

BHP supports action to increase the availability of carbon offsets in the near-term and long-term, by addressing barriers to offset supply through grant funding, research and development, and market and policy advocacy. For example, in 2022 we launched a grants program to help drive the development of the Australian blue carbon market and have provided over AUD $5 million to support emerging blue carbon methods and projects.

3 Adaptive management and continuous improvement and review of Regional GHGMP

3.1 Adaptive management

BHP applies an adaptive management framework for implementing management measures identified in this Regional GHGMP, consistent with the Instructions. Adaptive management is a cycle of monitoring, reporting and implementing change that allows an evaluation of the management and mitigation measures so that they are progressively improved and refined, or alternative solutions adopted, so that the objectives and outcomes of the Regional GHGMP are achieved.

In line with the adaptive management framework, this Regional GHGMP shall be monitored, reviewed and updated every 3 years or otherwise as required, considering:

- new processes, procedures and/or activities within the Regional GHGMP Boundary that have the potential to materially change emissions that were not previously forecasted in this Regional GHGMP;
- commentary from the WA EPA or other relevant decision-making authorities during assessment and approvals processes; and
- significant changes in State or Commonwealth climate change legislation or policy.

3.2 Continuous improvement

BHPIO applies continuous improvement principals through a range of frameworks, these include:

- Maintaining ISO:14001 (Environmental Management Systems) accreditation. An aspect of an effective environmental management system as defined by ISO:14001, is the application of the plan-do-check-act model of continuous improvement.
- Environment and Climate Change: Our Requirements (BHP 2020b), sets BHP's expectations for management of climate change from our operations, and include identification of opportunities annually for GHG emissions reductions; and
- Additionally, climate change impacts and mitigation measures are considered through Sustainability in Design standards for major projects.

4 Monitoring and reporting

There is potential for substantial change to GHG policies, markets, technology and regional energy infrastructure over the lifetime of BHPIO's operations, which may influence the reasonableness or practicability of the GHG abatement measures described in this Regional GHGMP. BHP completes periodic reviews of policies, markets, technology and infrastructure as part of our adaptive management approach described in this Regional GHGMP.

BHPIO will make the latest endorsed version of this Regional GHGMP publicly available to stakeholders through BHP's website at bhp.com within two weeks of receiving written confirmation from the CEO of DWER.

4.1 Emissions monitoring and reporting

On an annual basis, BHP will:

- publicly report performance against the Safeguard Mechanism derived emissions reduction trajectory for each NGER facility relevant to this Regional GHGMP, aligned with NGER Act obligations. The CER will publish a summary of reported emissions, the annually determined production-adjusted baseline, net emissions including surrendered SMCs and ACCUs by 1 March following a compliance period (financial year). BHP will include a summary of the relevant NGER Facility information, linked to each of the Proposals, through relevant Ministerial Statement Annual Compliance Assessment Reports if applicable.
- review decarbonisation plans applicable to each of the Proposals annually as part of BHP's capital allocation process, to take into account studies of potential decarbonisation initiatives conducted by BHP or others to assess the technology readiness, abatement efficiency, ease of operational integration and other relevant factors.

On a 5-yearly interval[9], BHP will report on:

- total and net Scope 1 GHG emissions from each NGER facility attributable to each Proposals;
- carbon offsets surrendered to achieve the proportion of the baseline for each NGER facility attributable to each Proposal during the reporting period
- the emissions intensity of each of the Proposals, benchmarking emissions intensity against comparable facilities
- a summary of GHG emission reduction and abatement measures implemented and delivered to avoid or reduce each Proposal's GHG emissions
- technology and initiatives under development relevant to each Proposal to achieve the emissions reduction trajectories set out in the Proposal Specific Schedules.

Annual monitoring will be conducted in accordance with the NGER Measurement Determination, with information provided for the purposes of reporting under this Regional GHGMP consistent with the

[9] BHPIO intends to align reporting to NGER Act financial year reporting and intervals with the Paris Agreement (e.g., FY2030, FY2035 etc)

summary of Scope 1 emissions and any surrendered offsets, and any other information, published as part of the Safeguard Mechanism by the CER.

Where relevant, the net GHG emissions associated with each of the Proposals for the reporting period included in the 5 yearly report, will be reviewed by an independent technical expert to verify that statements are credible and/or reasonable where methodologies or definitions may not be aligned with nationally recognised frameworks.

5 Stakeholder consultation

During the development of each Proposal, BHP undertook targeted stakeholder engagement based on interest and proximity to each of the Proposals. BHP meets regularly with the identified key stakeholders to facilitate regular, open and honest dialogue to understand expectations, concerns and interests of stakeholders and to incorporate them into business planning.

Stakeholder consultation is summarised in each Proposal Specific Schedule. BHP will continue to consult with relevant stakeholders in the context of each Proposal as applicable.

6 Changes to an EMP

This Section is not applicable as this Regional GHGMP (v1) is the original version. This Section will be updated in future versions.

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Schedule 2: Yarnima Power Station Stage 4 (Gas Reciprocating Engines)

April 2024

Version Control

Version	Description of version	Key changes	Issue date
Version 0	Draft version for KNAC review	Original draft document	18 September 2023
Version 1	Original document	Edits to incorporate into Regional GHGMP	2 April 2024

1 Proposal description and approach

<table>
<tr><th colspan="2">Yarnima Power Station Stage 4 (Gas Reciprocating Engines) Greenhouse Gas Management Plan</th></tr>
<tr><td>Proposal name</td><td>Yarnima Power Station Stage 4 (Gas Reciprocating Engines) Proposal</td></tr>
<tr><td>Proponent name</td><td>BHP Iron Ore Pty Ltd</td></tr>
<tr><td>Proposal description and scope</td><td>BHPIO owns and operates an islanded power network, which supplies electricity to BHP's Pilbara mining operations and the Newman township. Yarnima CCGT generation is the primary source of electricity to that network and has a firm capacity of 119 MW. The network is also supported by diesel power generation at Yarnima with a firm capacity of 35 MW (TPS) and diesel power generation at Mining Area C (MAC PS) with a firm capacity of 10 MW.

Power demand on BHPIO's Pilbara network is approximately 150 MW. By 2040, we estimate our operations will need a peak power demand of around 1GW, approximately 900 MW more than today (BHP 2022b). Increased power generation is required to support iron ore production, coupled with increasing energy needs associated with dewatering required to access deeper ores, and electrification of rail and fleet across our operations.

BHPIO is proposing to install Gas Reciprocating Engines (GREs) at Yarnima (the Yarnima Proposal) (Figure 6 & Figure 7), delivering a maximum additional installed capacity of up to 120 MW, intended to support the planned electrification and decarbonisation of BHPIO's iron ore operations. GREs have been selected due to their high-efficiency, low emissions-intensity when compared to other firm generation alternatives (including existing BHPIO diesel power generation), and capability to respond rapidly to intermittency issues associated with the planned electrification of equipment and renewable energy penetration of BHP's power transmission network.

As the proportion of renewable power available to the Pilbara network grows, Scope 1 emissions from electricity generated by Proposal activities will decrease as renewable technologies displace thermal generation provided by the Proposal. During periods of lower renewable power generation, thermal generation can be utilised to offset the unavailability of renewable power supply (Figure 8).

The installation of higher efficiency GREs will also enable BHPIO to cease operation of 10 MW of diesel power generation from MAC PS and 35 MW of diesel power generation from the TPS, reducing net emissions.</td></tr>
<tr><td>Emission estimates[10]</td><td>
<table>
<tr><th>Emissions (t CO_2-e)[11]</th><th>Annual average</th><th>Life of Proposal</th></tr>
<tr><td>Scope 1</td><td>916,601</td><td>23,831,630</td></tr>
<tr><td>Scope 2[12]</td><td>-</td><td>-</td></tr>
<tr><td>Scope 3</td><td>71,149</td><td>1,849,870</td></tr>
</table>
</td></tr>
</table>

[10] Emissions estimates include the Yarnima Proposal plus the existing Yarnima Power Station phases.

[11] Proposal emission estimates include Yarnima's gas turbines, waste heat recovery and gas reciprocating engines. MAC power station is excluded from these summaries as it is a separate proposal and subject to MS 1072.

[12] There are no Scope 2 emissions associated with this Proposal.

Yarnima Power Station Stage 4 (Gas Reciprocating Engines) Greenhouse Gas Management Plan	
Trajectory of emissions reductions	BHPIO has adopted an indicative emissions reduction trajectory for the Yarnima Proposal for Scope 1 emissions aligned with the Safeguard Mechanism.
Proposed construction date	2027
Proposed project end of life/decommissioning date	2052

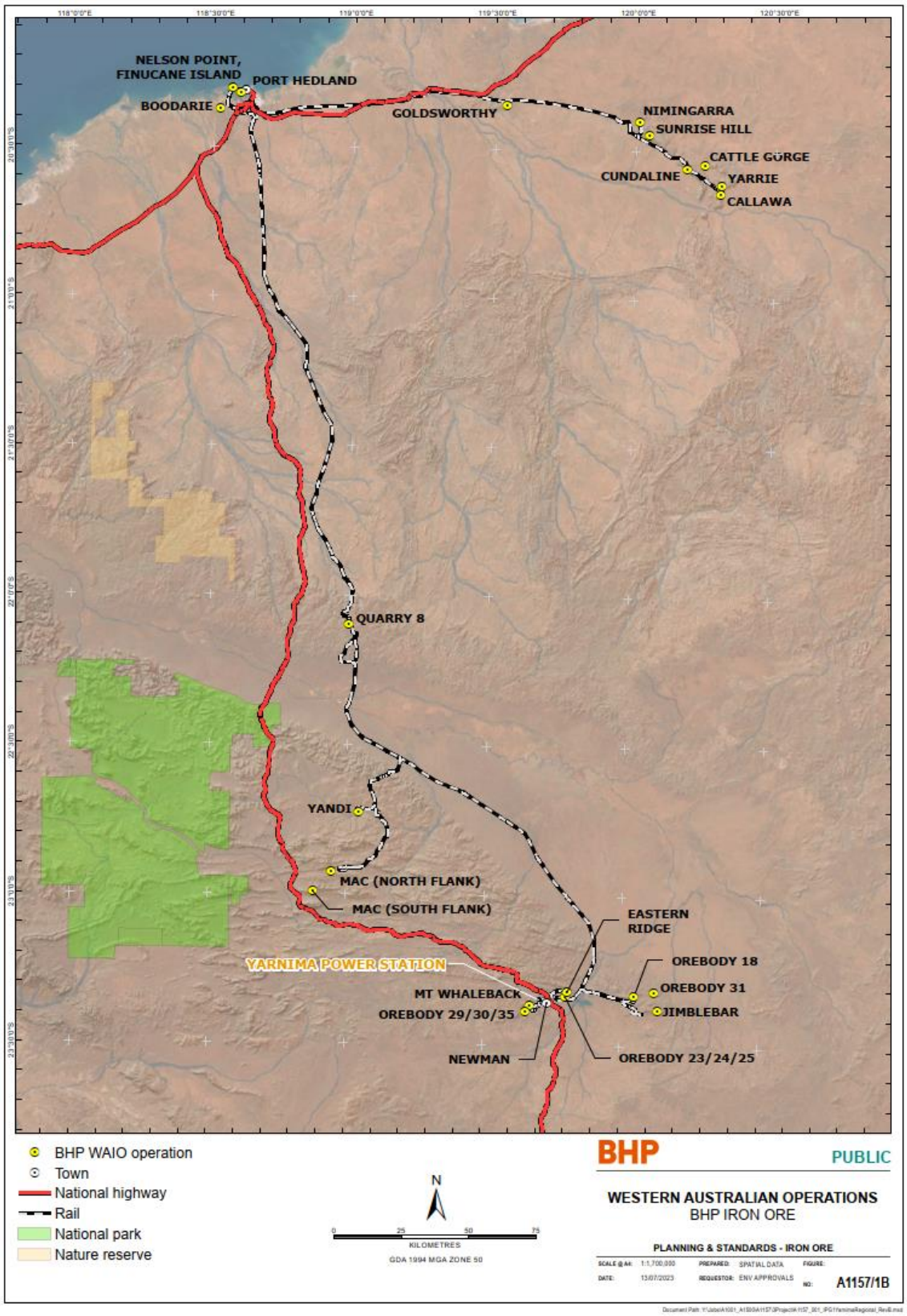

Figure 6: Yarnima power station and Proposal location

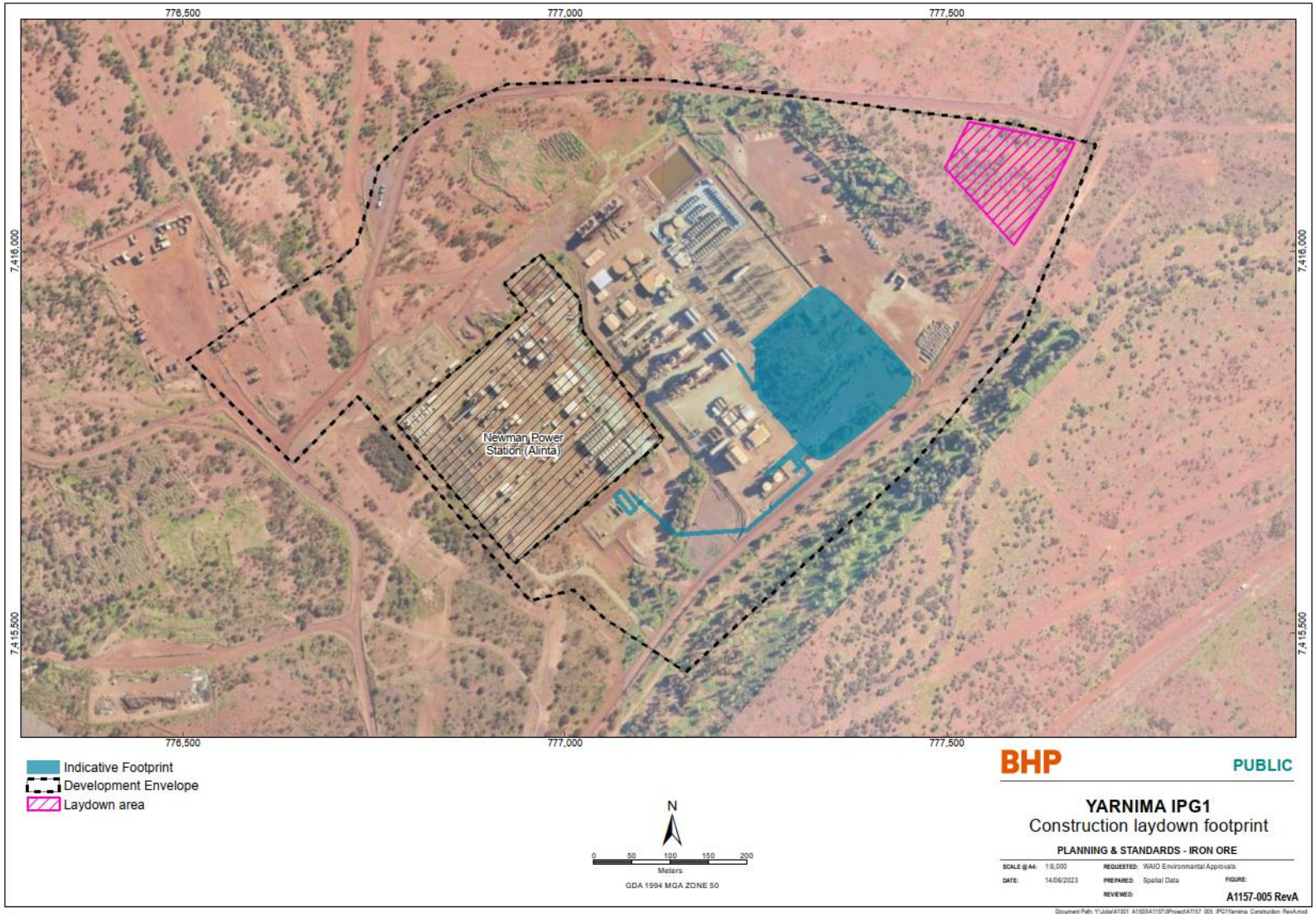

Figure 7: Yarnima Development Envelope and Indicative Footprint

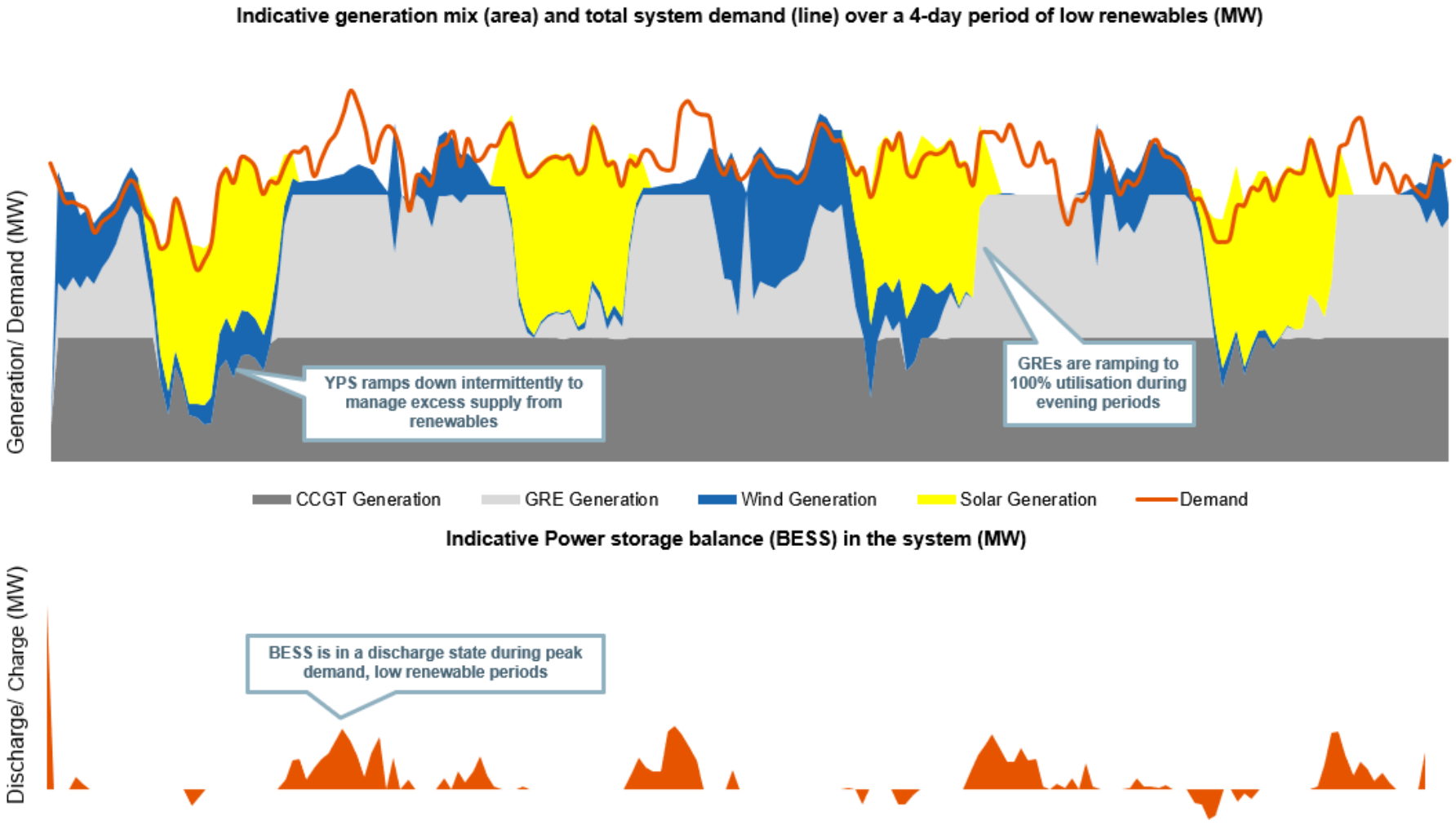

Figure 8: Indicative energy sources over a 4-day period of low renewables[13]

[13] Based on forecast electricity consumption, which is subject to change

1.1 Environmental factor, values, activities and impacts

Table 5 below summarises the activities, values and actual or potential impacts relevant to the Yarnima Proposal.

Table 5: Yarnima Proposal Environmental factor, values, activities and impacts

Key environmental factor	Environmental values	Proposal activities	Actual/Potential impacts
Greenhouse Gas Emissions	Domestic and global environmental values potentially impacted by climate change	Natural gas consumption for power generation	**Direct impacts** Direct release of greenhouse gas emissions
		Diesel consumption for construction and emergency power generation	
		Land clearing for construction	
		Upstream, emissions generated in the extraction and production of fossil fuels (natural gas and diesel)	**Indirect impacts** Indirect release of greenhouse gas emissions

2 Emissions estimates and emission reduction trajectory

2.1 Yarnima Proposal GHG emissions estimates

Scope 1, Scope 2 and Scope 3 GHG emissions associated with the Yarnima Proposal are summarised in Table 6. The efficiencies associated with the GREs included in the Yarnima Proposal are based on OEM estimates included in engine supplier data sheets.

Table 6: Summary of Emissions Estimates for the Proposal

Proposal	Emissions (t CO_2-e)		
	Scope	Annual average	Life of Proposal
Yarnima - Stage 4 (Proposed power generation & existing)	Scope 1	916,601	23,831,630
	Scope 2	-	-
	Scope 3	71,149	1,849,870
Yarnima - Stage 4 (Proposed power generation only - GREs)	Scope 1	454,649	11,820,870
	Scope 2	-	-
	Scope 3	35,290	917,540

Electricity Demand Forecast informing GHG emission estimates

The demand scenario presented in Table 7 is aligned with BHPIO's long-term plans and includes the anticipated power demand from electrification of fleet and rail. The estimated efficiencies of the existing Yarnima per unit of electricity generation are based on the recent reported electricity generation and emissions.

Emission calculations utilise two sets of electrical load data. The first data set is the actual hourly electricity demand for the 2019 calendar year. The data from 2019 is used because it is the last full operation year where BHPIO didn't have a significant change in its operations (e.g. the South Flank development) and is considered to be a "steady state" operation. The second data estimates future load demand to enable BHPIO's decarbonisation plans (Pathways to Net Zero – P2NZ), which includes electrification of diesel consuming equipment, providing a forecast of estimated annual power demand to 2050.

Table 7: Annual Peak Operational plus Average Decarbonisation Demand (MW)

FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33 onwards[14]
157	175	185	230	265	308	344	412	412	412

2.1.1 Yarnima Proposal Scope 1 emissions

The Scope 1 emissions profile of the Yarnima Proposal is illustrated in Figure 9. Details of the estimated annual and lifetime Scope 1 emissions, including specific sources are included in Table 8.

[14] Both load forecasts are constant from 2032 to 2052 based on demand assumptions incorporated in the forecast and is correct as of July 2023.

2.1.2 Yarnima Proposal Scope 2 emissions

There are no Scope 2 emissions associated with the Yarnima Proposal.

2.1.3 Yarnima Proposal Scope 3 emissions

The total Scope 3 emissions associated with the Yarnima Proposal are the upstream activities to produce and transport natural gas via pipeline, and diesel for power generation have been estimated to be 71,149 t CO_2-e (annual average) and 1,849,870 t CO_2-e (total life of the Yarnima Proposal). There are no downstream sources of Scope 3 emissions.

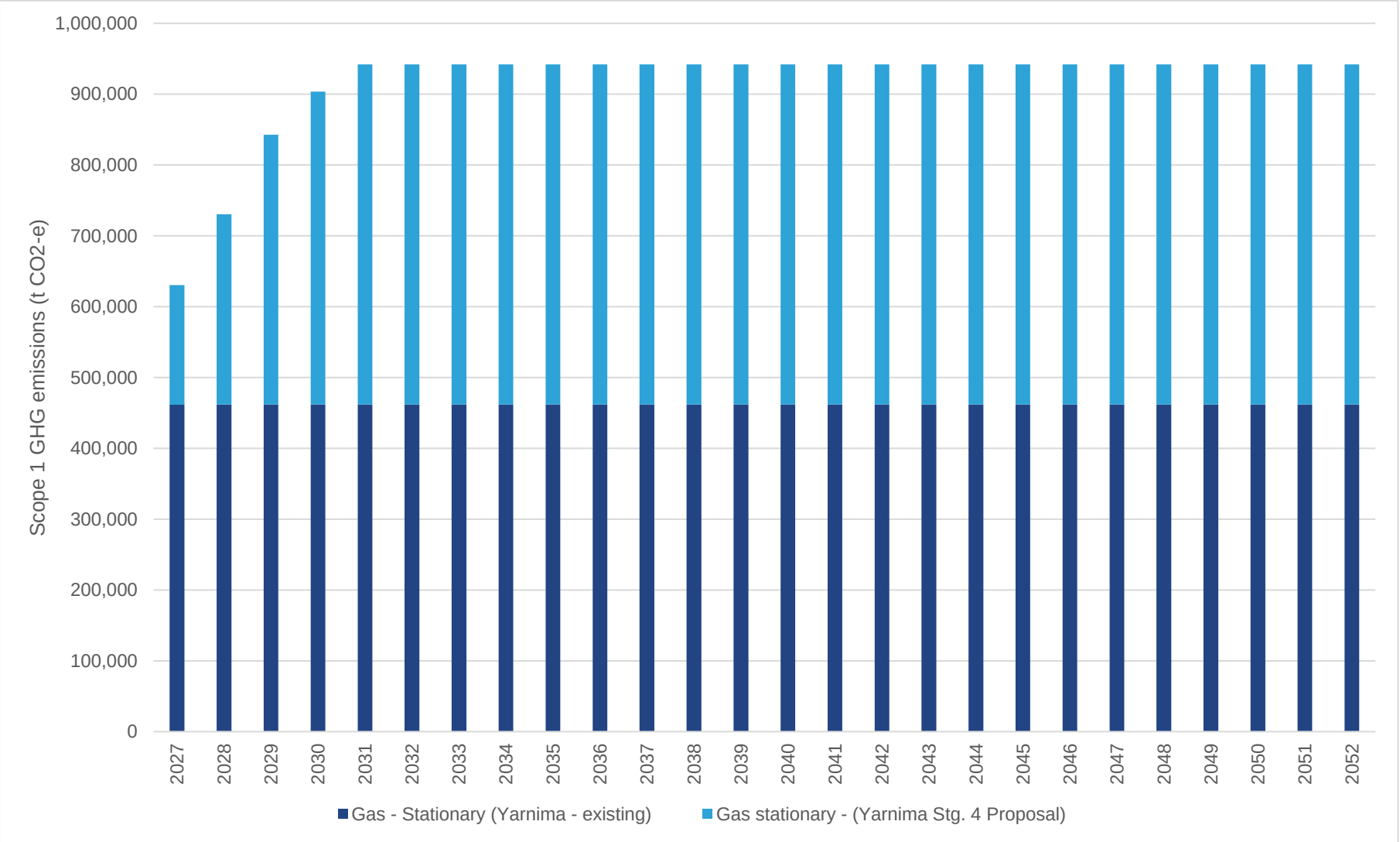

Figure 9: Emissions profile – Scope 1 GHG emissions baseline of the Yarnima Proposal

Table 8: Source of Scope 1 emissions for emissions baseline of the Yarnima Proposal (t CO_2-e)

Year[15]	Total	Yarnima Power Station – Gas Stationary (existing)	GREs – Gas Stationary (Proposal)	GREs – Land Clearing (Proposal)[16]
FY2025	**-**	-	-	78
FY2026	**-**	-	-	-
FY2027	**630,600**	461,550	169,050	-
FY2028	**730,540**	461,930	268,610	-
FY2029	**842,720**	461,970	380,750	-
FY2030	**903,770**	461,970	441,800	-
FY2031	**942,000**	461,970	480,030	-
FY2032	**942,000**	461,970	480,030	-
FY2033	**942,000**	461,970	480,030	-
FY2034	**942,000**	461,970	480,030	-
FY2035	**942,000**	461,970	480,030	-
FY2036	**942,000**	461,970	480,030	-
FY2037	**942,000**	461,970	480,030	-
FY2038	**942,000**	461,970	480,030	-
FY2039	**942,000**	461,970	480,030	-
FY2040	**942,000**	461,970	480,030	-
FY2041	**942,000**	461,970	480,030	-
FY2042	**942,000**	461,970	480,030	-
FY2043	**942,000**	461,970	480,030	-
FY2044	**942,000**	461,970	480,030	-
FY2045	**942,000**	461,970	480,030	-
FY2046	**942,000**	461,970	480,030	-
FY2047	**942,000**	461,970	480,030	-
FY2048	**942,000**	461,970	480,030	-
FY2049	**942,000**	461,970	480,030	-
FY2050	**942,000**	461,970	480,030	-
FY2051	**942,000**	461,970	480,030	-
FY2052	**942,000**	461,970	480,030	-
Average[17]	**916,601**	**461,970**	**480,030**	-
Total	**23,831,708**	**12,010,760**	**11,820,870**	78

[15] The Scope 1 emissions for FY2025 prior to the commencement of the Proposal

[16] Approval for land clearing to be sought via native vegetation clearing permit

[17] Average emissions correspond to the Proposal commencement from FY2027 to FY2052

2.2 Contribution of the Yarnima Proposal to State and National GHG Emissions

The estimated average annual emissions for the Yarnima Proposal have been compared to recent national and state GHG emissions totals in Table 9. The Yarnima Proposal estimate is inclusive of Scope 1 emissions from the existing infrastructure associated with Yarnima.

Table 9: Impact on National and State Annual GHG Emissions for scenarios

	WA GHG Emissions[18] (%)	National GHG Emissions[19] (%)
Yarnima Proposal Scenario (existing and proposed power generation)	1.142	0.198
Yarnima Proposal Scenario (proposed power generation only - GREs)	0.567	0.098

2.3 Yarnima Proposal indicative emissions reduction trajectory

BHPIO has adopted an indicative emissions reduction trajectory for the Yarnima Proposal for Scope 1 emissions aligned with the Safeguard Mechanism. Table 10 and Figure 10 summarise the indicative emission reductions for the Yarnima Proposal.

[18] Estimate based on 2021 Western Australian State Inventory emissions reported by DCCEEW.

[19] Estimate based on 2022 National emissions reported by DCCEEW.

Table 10: Scope 1 GHG Emissions attributable to the Yarnima Stage 4 Proposal[20]

Fiscal Year	Baseline emissions – Yarnima Stage 4 ($t CO_2$-e)	Cumulative Safeguard Mechanism decline rate (%)	Net Indicative Emissions Reduction Trajectory ($t CO_2$-e)
2027	630,600	19.6	507,002
2028	730,540	24.5	551,558
2029	842,720	29.4	594,960
2030	903,770	34.3	593,777
2031	942,000	37.6	587,949
2032	942,000	40.9	557,005
2033	942,000	44.2	526,060
2034	942,000	47.4	495,115
2035	942,000	50.7	464,171
2036	942,000	54.0	433,226
2037	942,000	57.3	402,281
2038	942,000	60.6	371,336
2039	942,000	63.9	340,392
2040	942,000	67.2	309,447
2041	942,000	70.4	278,502
2042	942,000	73.7	247,558
2043	942,000	77.0	216,613
2044	942,000	80.3	185,668
2045	942,000	83.6	154,724
2046	942,000	86.9	123,779
2047	942,000	90.1	92,834
2048	942,000	93.4	61,889
2049	942,000	96.7	30,945
2050	942,000	100.0	-
2051	942,000	100.0	-
2052	942,000	100.0	-

[20] Emissions associated with MAC Power Station have not been included as these emissions reside outside of the Proposal's development envelope

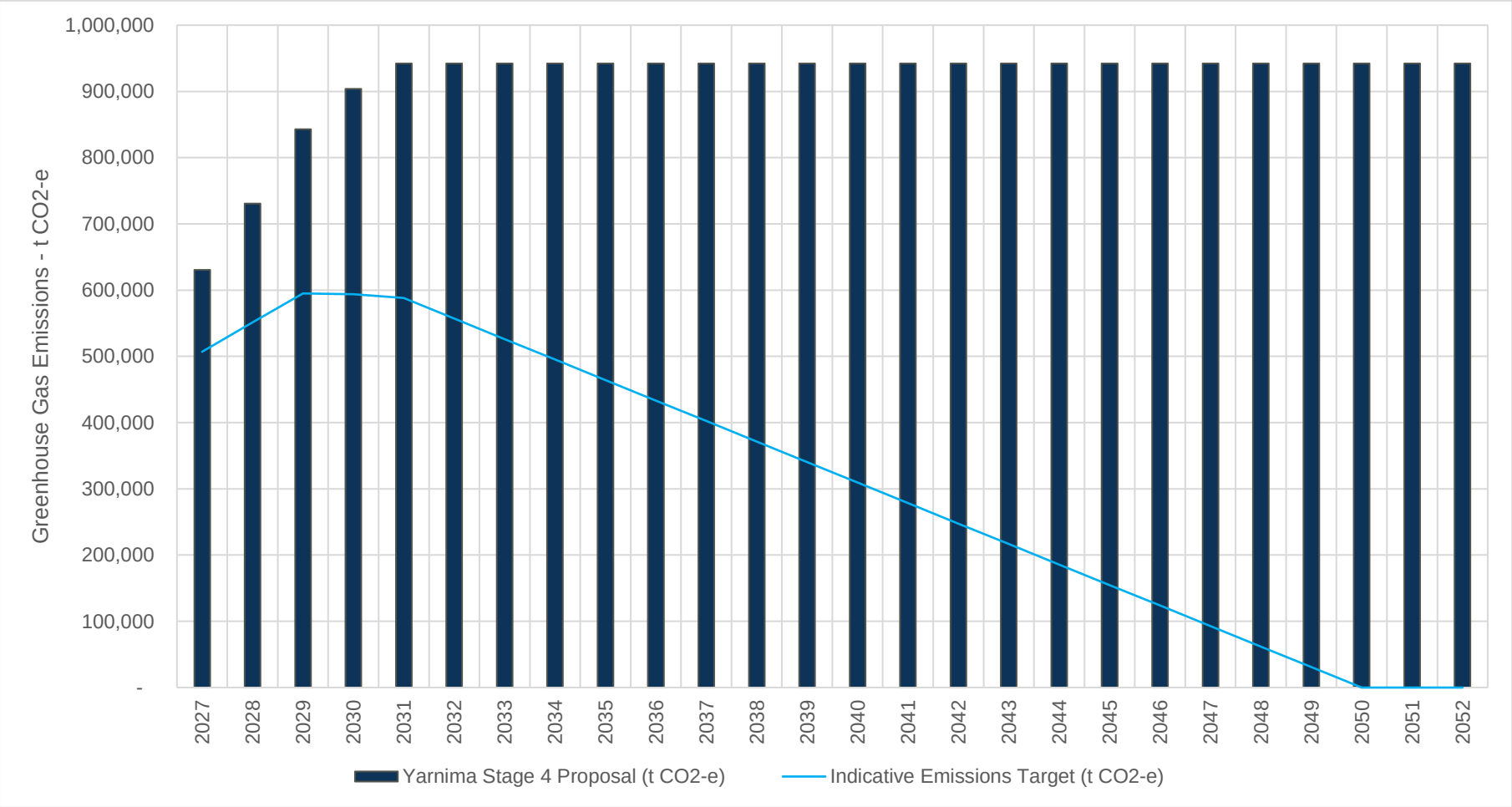

Figure 10: Scope 1 emissions baseline and indicative emission reduction trajectory

2.4 Yarnima Proposal benchmarking assessment

Table 11 summarises the estimated of Scope 1 GHG emissions intensity for the Yarnima Proposal, averaged over the life of the operation.

Table 11: Estimated Scope 1 GHG emissions intensity for the Yarnima Proposal

Units	Units	Proposal + Existing	Proposal Only
Total Scope 1 Emissions	t CO_2-e	23,831,630	11,820,870
Average emissions intensity	t CO_2-e/MWh	0.46	0.46

2.4.1 Industry benchmarks

Table 12 summarises the benchmarking assessment of the Yarnima Proposal to comparable power stations located in the Pilbara region, which illustrates the forecast Scope 1 GHG emissions intensity from the Yarnima Proposal is comparable or better than relevant industry benchmarks.

Figure 11 compares the Yarnima Proposal to both the Safeguard Mechanism's default emissions intensity and 2022 Australian average electricity generation emissions intensity.

Domestic and International Benchmarking Considerations

Increased ambient temperature decreases thermal efficiency of thermal power generation. Studies indicate that when compared to ISO conditions (e.g. 15°C and 101.3 kPa), every degree Celsius rise above ISO conditions decreases thermal efficiency by approximately 0.06% (Fernandez et al. 2021). As ambient temperature is a significant factor contributing to thermal efficiency and emissions intensity, the Proposal has focused benchmarking of electricity generation to other Australian operations.

Relevant benchmarks for the Proposal include other power stations operating in similar high ambient temperature conditions.

Table 12: Estimated Scope 1 GHG emissions intensity of comparable power stations in WA

Power Station	EPA Assessment Number	Ministerial Statement number and date	Maximum capacity (MW)	Emissions intensity (tCO_2e/MWh)
Proposal & Existing	TBD	TBD	120	0.46
Pilbara Energy Generation	2250	1161	165	0.46
Port Hedland Power Station Expansion	2307	N/A	60	0.48
South Hedland	N/A	N/A	154	0.52
Paraburdoo	2189	MS 1195 04/08/2022	127.5	0.54
West Angelas	2290	MS 1113 02/09/2019[21]	90	0.56
Yurralyi Maya	N/A	N/A	230	0.58
Cape Lambert	N/A	N/A	130	0.59
Solomon	2250	MS 1161 01/02/2021	228.6	0.61
Karratha	N/A	N/A	96	0.70
Newman	N/A	N/A	162	0.70
Port Hedland	2307 (Currently under assessment)	N/A		0.75

[21] As amended on 16/04/2021

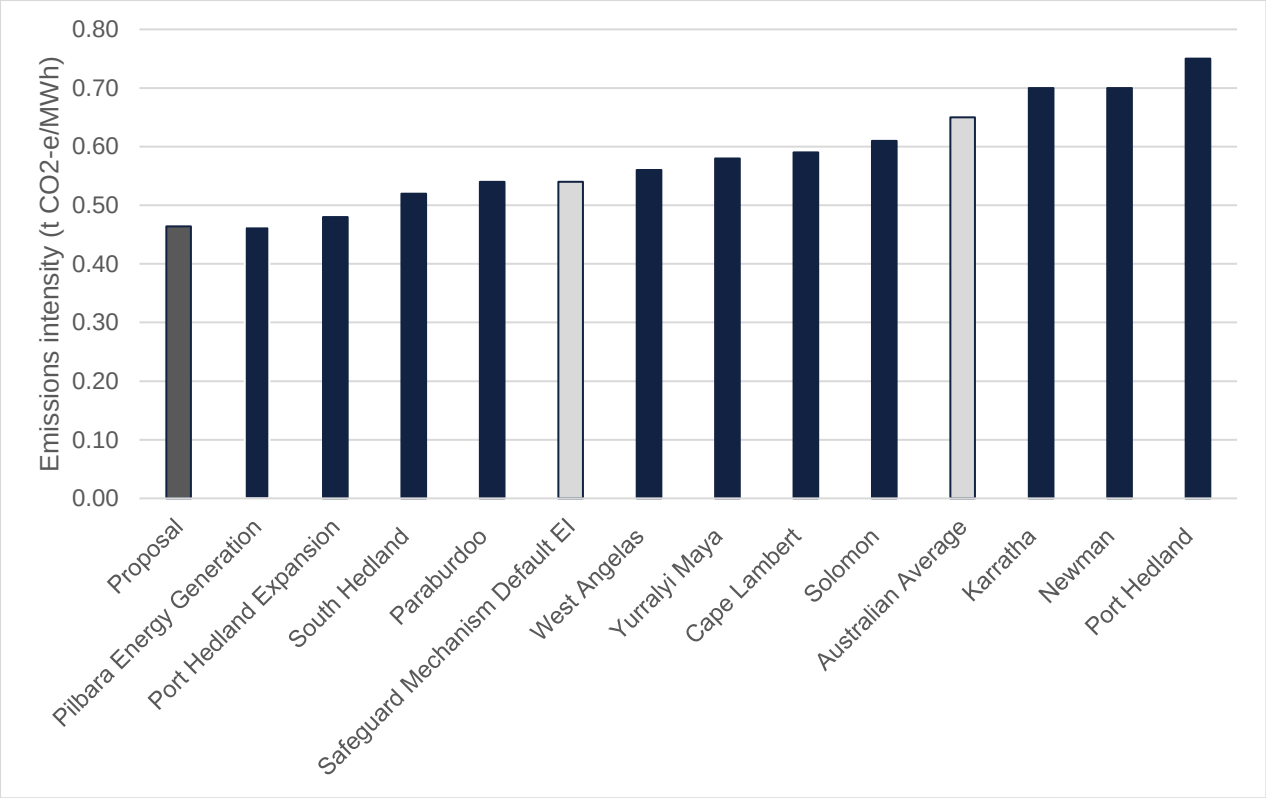

Figure 11: Scope 1 emissions intensity benchmarking of comparable power stations in WA (t CO2-e /MWh)

3 Emissions management measures and strategies

3.1 Yarnima Proposal measures to avoid and reduce Scope 1 emissions

The Yarnima Proposal acts as a flexible and reliable complement to smooth out the intermittency of renewable power generation (that is connected via inverters) and ensure a stable power supply as the BHP grid transitions for the following reasons:

- In conjunction with meeting demand, a reliable power system must be able to balance power supply and demand instantaneously. Should a sudden spike or drop in either quantity occur, the frequency of the system (nominally 50 Hz) can rapidly deviate from safe margins, defined as within 0.5 Hz of the central band. This frequency change may damage plant and equipment and would require activation of BHP's automatic load shedding to bring the frequency back into a safe range. To avoid this situation, rapidly dispatchable generation reserves that can near-instantaneously ramp their output to offset any rapid variations in either supply or demand are required. The GRE's provide the ability to ramp up or down very quickly to compensate for fluctuations in renewable energy generation, thereby helping to maintain a steady power supply.
- The protection relays that detect faulted components on the power system respond to the higher currents associated with fault conditions (referred to as fault current) to detect and disconnect the faulted component. Synchronous generators can provide fault current 5-8 times the normal full load operating current, where inverters can only provide fault current at 1-2 times their normal full load operating current. Fault current falls as the distance from the generating source increases. On BHPs long network it is possible that inverters alone may not be able to provide the fault current required to operate the existing electrical protection systems. To avoid wholesale changes of electrical protection systems at all the load centres, a minimum level of fault current will need to be maintained. The GRE's are a form of synchronous generation that provide fault current to support continued operation of electrical protection systems.
- With synchronous generators in grid forming mode, most inverters operate in grid following mode. In grid following mode the inverter output is defined with reference to the incoming waveform at the inverter terminals. System strength refers to the ability for generating systems to remain connected to the system following power system disturbances. The GRE's are a form of synchronous generation that provides increased system strength to support the continued operation of inverter connected renewable generation.

Two scenarios were considered for the Yarnima Proposal, which varied the power generation technologies selected to meet forecast power demand associated with BHPIO's iron ore processing activities, Newman township electricity demand and the planned electrification of mining fleet and locomotives. This load demand scenario (P2NZ load scenario) has been used to model the two source scenarios being the most representative scenario for BHPIO's future operations.

The P2NZ load scenario demand is anticipated to exceed the capacity of Yarnima Power Station and the Proposal from 2027. The Yarnima Proposal assumes Yarnima Power Station's gas generation and waste-heat recovery will operate alongside the Proposal for additional GREs at nameplate capacity from 2031. Additional power generation projects aligned with BHPIO's decarbonisation strategy will be

required and the subject of future environmental approvals to meet the shortfall in power generation to P2NZ load scenario, illustrated in Figure 12.

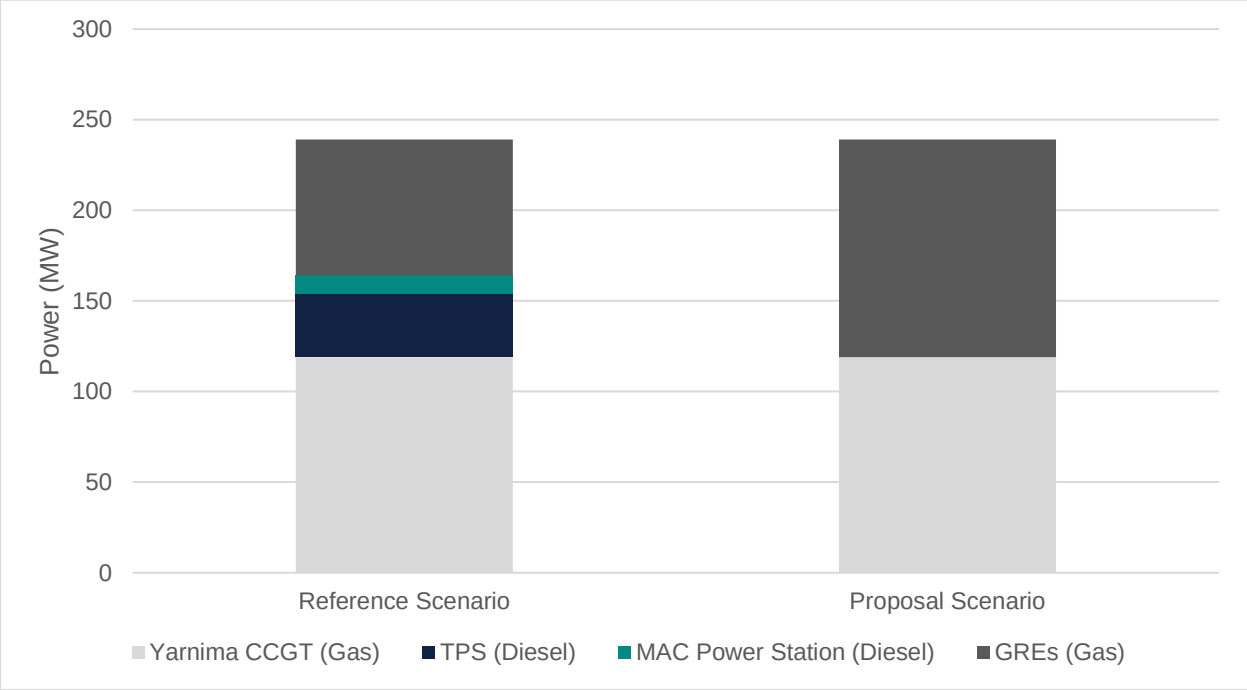

Figure 12: Overview of nameplate power generation scenarios: FY2029 onwards

Reference Scenario

The Reference Scenario assumes peak power demand of 239 MW is fulfilled by a combination of both existing and approved generation, existing generation includes; Yarnima Power Station, firm capacity of 119 MW utilising gas generation and waste heat recovery; TPS, firm capacity of 35 MW of diesel generation; and MAC Diesel Power Station, firm capacity of 10 MW.

In this Reference Scenario GREs provide the incremental generation (75MW) above the capacity of the existing diesel power stations (45 MW) and Yarnima (119 MW).

Proposal Scenario

The Proposal Scenario assumes peak power demand of 239 MW is fulfilled by Yarnima Power Station, firm capacity of 119 MW utilising gas generation and waste heat recovery and GRE's provide incremental generation (120 MW). Existing diesel generation is displaced by high efficiency GRE's.

The Proposal Scenario has been selected due to the highly efficient GREs, which are comparable to Yarnima's Combined Cycle Gas Turbines (CCGTs). The GREs provide significantly more operational flexibility, which will enable it to provide firm generation capacity during periods of increased demand and to manage the variability of renewable energy output. The increased efficiency and generation support provided by the GREs will also displace generation from the existing MAC power station and TPS. Note that the avoided emissions from the Proposal Scenario assumes that the operation of both the proposed GREs and Yarnima's CCGT's continue to plan, without unforeseen or short-term generation and load demand challenges, which may include the need to additional power generation in an emergency and as a contingency, when gas turbine generator capacity is undergoing maintenance.

Additionally, the Proposal Scenario's technology selection may be capable of operating with a natural gas and hydrogen blend of up to 25% hydrogen by volume in the future. BHP understands that the

equipment suppliers are developing the technology to operate on higher percentage of hydrogen however these are not yet commercially available. Further, BHP has been advised that equipment suppliers are aiming to have engines capable of operating on 100% hydrogen in the future as the technology is developed. This will reduce emissions as hydrogen is associated with reduced emissions compared to natural gas.

3.1.1 Reduced emissions – firm power generation

Reduced Emissions – Firm Power Generation

The Proposal Scenario to install 120MW of GREs as opposed to the Reference Scenario, a combination of traditional diesel power stations and GREs to supplement up to 120MW is anticipated to reduce Scope 1 emissions by 3,096,300 t CO_2-e, which represents a 10.9% reduction in Scope 1 emissions. The GRE's have been selected on the basis that they are more efficient, able to better respond to network fluctuations and demands.

Further reducing emissions associated with electricity supply is pivotal to reaching net zero emissions. Section 2.5.2 summarises BHPIO's decarbonisation strategy, which includes up to 500MW of additional renewable energy and storage by 2030 to meet power demand associated with BHPIO's iron ore mining operations and electrification of mining equipment and locomotives. Additionally summarised in Section 2.5.2 is the requirement for firm generation capacity, this Proposal intends to enable BHPIO's decarbonisation strategy and transition to renewable energy by managing renewable energy variability (Figure 8).

A summary of the annual, maximum and total forecast Scope 1 emissions for the Reference Scenario and Proposal Scenario are outlined in Table 13 and Table 14 respectively below. The full estimated annualised emissions for both operational scenarios are detailed in Figure 13.

Table 13: Annual Forecast Scope 1 GHG emissions for the Reference scenario (t CO_2-e)

Source	Maximum annual emissions	Total emissions over life of Proposal	Average annual emissions
Yarnima power station	461,970	12,010,760	461,952
MAC Diesel Power Station[22]	67,820	1,760,960	67,729
TPS Diesel Power Station	237,370	6,091,160	234,275
Proposal (GREs)[23]	295,180	7,064,950	271,729
Total	**1,062,340**	**26,927,830**	**1,035,686**

[22] MAC diesel power station is connected to BHPIO's inland grid, supplying power. The Proposal intends to displace this diesel generation, which is located outside of the Proposal's development envelope.

[23] Based on GREs operational in 2027.

Table 14: Annual Forecast Scope 1 GHG emissions for the Proposal[24] scenario (t CO_2-e)

Source	Maximum annual emissions	Total emissions over life of Proposal	Average annual emissions
Yarnima power station	461,970	12,010,760	461,952
MAC Diesel Power Station	-	-	-
TPS Diesel Power Station	-	-	-
Proposal (GREs)	480,030	11,820,870	454,649
Total	**942,000**	**23,831,630**	**916,601**

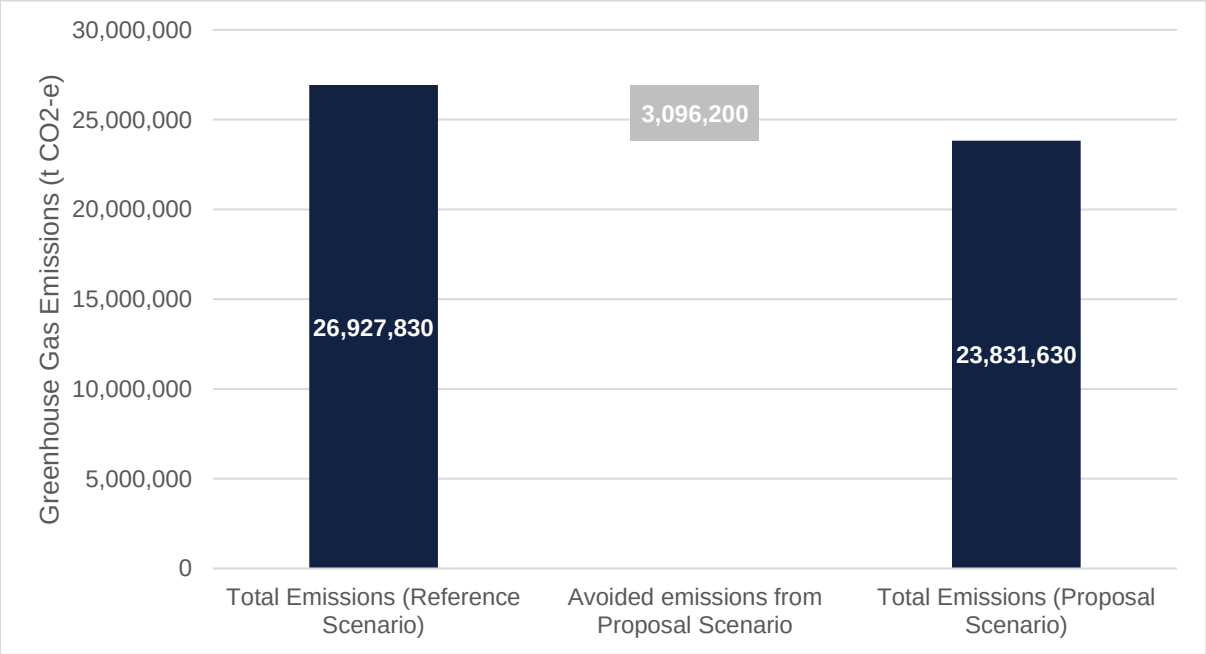

Figure 13: Emissions comparison of Scope 1 emissions (t CO2-e) from both Baseline and Yarnima Proposal scenarios

[24] Under the Proposal scenario, MAC and Yarnima diesel are retired in 2027 once the Proposal (GREs) is operational in 2027

3.2 Yarnima Proposal measures to avoid and reduce Scope 3 emissions

Table 15 and Table 16 summarise the Scope 3 emissions associated with the Reference Scenario and Proposal Scenario. BHPIO's Yarnima Proposal to install high efficiency GREs enables existing diesel-based electricity generation to be displaced at MAC Diesel Power Station and diesel generation at Yarnima. The implementation of the Proposal scenario is estimated to reduce Scope 3 emissions by 1,565,860 t CO_2-e or equivalent to a 54.2% reduction when compared to the Reference scenario.

All Scope 3 emissions estimates do not contain any forward-looking views on potential emissions abatement measures that may occur in the value-chain that may impact future Scope 3 emissions. As BHPIO's decarbonisation strategy (Section 2.5.2) is implemented renewable electricity will displace power generation from Yarnima's GREs and CCGT which use natural gas as fuel. Scope 3 emissions will reduce proportionally with decreases to gas power generation.

Table 15: Annual Forecast Scope 3 GHG emissions for the Reference scenario (t CO_2-e)

Source	Maximum annual emissions	Total emissions over life of Proposal	Average annual emissions
Yarnima power station	35,860	932,330	35,859
MAC Diesel Power Station[25]	16,710	433,890	16,688
Yarnima Diesel Power Station	58,500	1,501,160	57,737
GREs[26]	22,910	548,340	22,910
Total	**133,980**	**3,415,720**	**131,374**

[25] MAC diesel power station is connected to BHPIO's inland grid, supplying power. The Proposal intends to displace this diesel generation, which is located outside of the Proposal's development envelope.

[26] Based on GREs operational in 2027.

Table 16: Annual Forecast Scope 3 GHG emissions for the Yarnima Proposal[27] scenario (t CO_2-e)

Source	Maximum annual emissions	Total emissions over life of Proposal	Average annual emissions
Yarnima power station	35,860	932,330	35,859
MAC Diesel Power Station	-	-	-
Yarnima Diesel Power Station	-	-	-
Proposal (GREs)	37,260	917,540	35,290
Total	**73,120**	**1,849,870**	**71,149**

[27] Under the Proposal scenario, MAC and Yarnima diesel are retired in 2027 once the Proposal (GREs) is operational in 2027

4 Stakeholder consultation

Stakeholder consultation undertaken specifically for the Yarnima Proposal is summarised below in Table 17.

Table 17: Yarnima Proposal – Stakeholder consultation

Stakeholder	Date	Topics/issues discussed	BHP response and outcome
KNAC – Implementation Committee meeting	16 June 2023	Included as an agenda item for notification of proposal to be presented to KNAC for comment	N/A
DWER – EPA Services	19 July 2023	BHPIO presented the Proposal at this pre-referral meeting. EPA Services queried the size of the Development Envelope and whether heritage surveys had been conducted over the Development Envelope.	BHPIO will confirm the heritage surveys which have been conducted in the Development Envelope and identify these in the Social Surroundings chapter of this document (Section 8).
KNAC	18 September 2023	Draft referral documentation provided for review. KNAC responded on 1 November 2023 with several comments relating to closure, air quality and noise impacts.	BHP responded on 22 November 2023, addressing all of KNAC's comments.
Shire of East Pilbara – Joint Technical Working Group meeting	23 January 2024	The Proposal was discussed as an agenda item and the Shire was notified of the upcoming submission to the EPA. The Shire had a query about recent power outages in certain areas of Newman.	The cause of the localized outages was not certain.