

BHP

Yarnima Power Station Stage 4 (Gas Reciprocating Engines)

Environmental Review Document – Referral Supplementary Report

2 April 2024



Document amendment record

Version	Description of version	Key changes	Date
Draft v0	Draft for review	None – original document	18 September 2023
v1	Updated document prepared in response to KNAC comments and for submission to EPA	Minor edits	02 April 2024

Abbreviations

Term	Meaning
ACCUs	Australian Carbon Credit Units
AUD	Australian Dollars
BESS	Battery Energy Storage System
BHP	BHP Group Ltd or the BHP group of companies, as the context requires
BHPIO	BHP Iron Ore Pty Ltd
CC Act	<i>Climate Change Act 2022 (Cth)</i>
CCGT	Combined Cycle Gas Turbines
CEO	Chief Executive Officer
CO ₂	Carbon dioxide
CO ₂ -e	Carbon dioxide equivalent
dB	decibel
DWER	Department of Water and Environmental Regulation
EP Act	<i>Environmental Protection Act 1986</i>
EPA	Western Australian Environment Protection Authority
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
ERD	Environmental Review Document
ERF	Emissions Reduction Fund
ETA	Environmental Technologies Analytics
FY	Financial Year
GHG	Greenhouse Gas
GHGMP	Greenhouse Gas Management Plan
GRES	Gas Reciprocating Engines
GW	Gigawatt
Ha	Hectares
HRSG	Heat Steam Recovery Generators

Term	Meaning
ICROA	International Carbon Reduction & Offset Alliance
IC-VCM	Integrity Council for the Voluntary Carbon Market
kL	Kilolitre
kt	kilotonne
kV	kilovolt
Km	Kilometre
MAC	Mining Area C
MNES	Matters of National Environmental Significance
MW	Megawatt
MWe	Megawatts electric
MWh	Megawatt hour
MVA	mega volt-amperes
NEPM	National Environment Protection (Ambient Air) Measure
NGER	National Greenhouse and Energy Reporting (Scheme)
NGER Act	<i>National Greenhouse and Energy Reporting Act 2007</i>
NO ₂	Nitrogen dioxide
NVCP	Native Vegetation Clearing Permit
P2NZ	Pathways to Net Zero
Program	BHP Pilbara Strategic Assessment Program
Proposal	The development of the Yarnima Power Station Stage 4 (Gas Reciprocating Engines)
RET	Renewable Energy Target
RPP	Renewable Power Percentage
tCO ₂ -e	Tonnes of Carbon Dioxide Equivalent
SMC	Safeguard Mechanism Credit
TEC	Threatened Ecological Community
WAIO	BHP's Western Australia Iron Ore
YPS	Yarnima Power Station

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Executive summary

Power demand at BHP Iron Ore Pty Ltd.’s (BHPIO’s) Western Australia operations is forecast to increase from approximately 150 megawatts (MW) currently to around 1 gigawatt (GW) by 2040. The additional power is required for reasons including iron ore production and decarbonisation projects, such as rail and mining fleet electrification, which are forecast to increase power demand substantially while BHPIO transitions to renewable energy sources.

BHPIO proposes to increase power generation at the existing Yarnima Power Station (YPS) through installation and operation of high efficiency, low emission intensity gas reciprocating engines (GREs) (the ‘Proposal’). The Proposal will displace existing higher emission intensity diesel generation, and this is expected to occur by 2027.

Implementation of the Proposal will ultimately enable renewable energy sources to be built and operated to support BHPIO’s operations. The Proposal will supply BHPIO’s Inland Power Grid with stable and efficient energy necessary to support the integration of renewable energy. The Proposal and BHPIO’s decarbonisation strategy have been independently verified as industry best practice for emissions reduction.

Table 1 to Table 3 below provide a summary of the Proposal, estimated greenhouse gas emissions and potential impacts, proposed mitigation and expected environmental outcomes.

Table 1: General Proposal content description

Proposal title	Yarnima Power Station Stage 4 (Gas Reciprocating Engines)
Proponent name	BHP Iron Ore Pty Ltd
Short description	<p>The Proposal is to increase power generation at the existing YPS, located approximately 2 km north-west of Newman in the Pilbara region of Western Australia (Figure 1-1).</p> <p>The Proposal comprises an increase in installed firm power generation capacity at the Yarnima Power Station from 154 megawatts (MW) up to 239 MW via installation and operation of gas reciprocating engines (GREs) and associated infrastructure. The GREs are likely to be installed in stages up to a maximum of 120MW (nominal). Associated infrastructure will include switchrooms, electrical connections, a new gas heater and extension of fuel piping and water supply systems, and other auxiliary equipment.</p>

Table 2: Proposal content elements

Element	Location / description	Maximum extent, capacity or range
Physical elements		
Gas reciprocating engines and associated infrastructure	Figure 2-1	Development Envelope of 47 ha
Operational elements		
Power generation	Figure 2-1	Up to 120 MW
Greenhouse gas emissions		
Peak annual		
Scope 1	Power generation	Total: 480,030 tCO ₂ -e/yr
Scope 2	None	
Scope 3	Fuel supply	Total: 37,260 tCO ₂ -e/yr
Annual average life of proposal		
Scope 1	Power generation	Annual average ¹ : 454,649 tCO ₂ -e/yr
Scope 2	None	None
Scope 3	Fuel supply	Annual average: 35,290 tCO ₂ -e/yr
Total Scope 1 and Scope 2 emissions		11,820,870 tCO ₂ -e (there are no Scope 2 emissions associated with the Proposal)
Other elements which affect extent of effects on the environment		
Maximum Proposal life		38 years (including construction, operation, decommissioning and closure)
Planned construction phase		3 years
Operations phase		26 years
BHPIO's closure strategies involve a sequenced decommissioning and demolition plan of power infrastructure. This will include removal of all surface infrastructure and services and footing to at least 0.6 m below ground level, management of any contamination, reshaping of the landform to manage drainage and erosion, rehabilitation of the area using regionally endemic vegetation followed by a post closure monitoring program.		

¹ Annual average emissions determined for the period 2027 to 2052, excluding the period that GREs associated with the Proposal will not be operating 2024 to 2026.

Table 3: Summary of potential impacts, proposed mitigation and expected environmental outcomes

Greenhouse Gas Emissions	
Potential impacts	<p>Emission of greenhouse gases</p> <p>The sources of the greenhouse gas (GHG) emissions associated with the Proposal include:</p> <ul style="list-style-type: none"> • Land clearing and diesel combustion for construction (Scope 1). • Combustion of natural gas for power generation (Scope 1). • Supply of gas fuel for the Proposal (Scope 3). • Scope 1 emissions: contribution of 454,649 tCO₂-e per annum (on average²) and a total of 11,820,870 tCO₂-e over the life of the Proposal
Mitigation hierarchy	<p>Avoid</p> <p>Displacing diesel with gas electricity generation has been calculated to result in 3,096,200 tCO₂-e of Scope 1 emissions avoided over the life of the Proposal, equivalent to 119,085 t CO₂-e Scope 1 emissions avoided annually.</p> <p>Reduce</p> <ul style="list-style-type: none"> • YPS is a highly efficient combined cycle gas turbine (CCGT) power station which emits approximately 35% less carbon dioxide than the Australian average³, achieved through waste-heat recovery. • The proposed GREs have been selected for high efficiency and low emissions intensity. • BHPIO will implement a GHG Management Plan (GHGMP) for the Proposal, which outlines BHPIO's strategy to reduce GHG emissions. <p>Offsets</p> <p>Where structural abatement of emissions is insufficient to meet the Proposal's emission reduction targets, BHPIO will ensure that these targets are met by retiring carbon offsets. BHPIO mitigates 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):</p> <ul style="list-style-type: none"> • spot markets • forward or long-term offtakes with guaranteed supplies upon project delivery

² Annual average emissions determined for the period 2027 to 2052, excluding the period that GREs associated with the Proposal will not be operating 2024 to 2026.

³ National Greenhouse Accounts Factors 2023, DCCEEW

Greenhouse Gas Emissions	
	<ul style="list-style-type: none"> • pre-payment for future guaranteed supplies • project origination, both within and outside of BHPIO's tenure. <p>In the context of BHPIO's preference is to source offsets domestically, in line with its operational footprint in WA and in recognition of the WA state government's preference for locally generated offsets. BHPIO may also source offsets from international markets, in accordance with WA Environment Protection Authority (EPA) guidance on the use of offsets within WA.</p>
Residual impacts, including assessment of significance	<p>The Proposal GHG emissions exceed the EPA Environmental Factor Guideline for Greenhouse Gas Emissions (April 2023) criteria of 100,000 tCO₂-e of Scope 1 emissions in any year for consideration under Part IV of the EP Act.</p> <p>Proposed Scope 1 emissions are detailed in Table 7-4, and equate to 0.567% of state and 0.098% of national total emissions (Appendix 6).</p> <p>GHG emissions will be mitigated in accordance with a GHGMP (Appendix 6). This approach minimises the risk of environmental harm associated with climate change by reducing greenhouse gas emissions in line with Australia's regulatory obligations.</p>
Proposed environmental outcomes	<p>GHG emissions will be mitigated over the life of the Proposal, in accordance with the GHGMP. This approach is consistent with the EPA objective to <i>"minimize the risk of environmental harm associated with climate change by reducing greenhouse gas emissions as far as practicable"</i> (EPA 2023b).</p>
Assessment of offsets (if relevant)	<p>Consideration of offsets for the Proposal are presented in the GHGMP.</p>

1 Introduction

The purpose of this document is to present the environmental impact assessment undertaken by BHPIO for the Yarnima Power Station Stage 4 (Gas Reciprocating Engines) Project (the Proposal) (Figure 1-1).

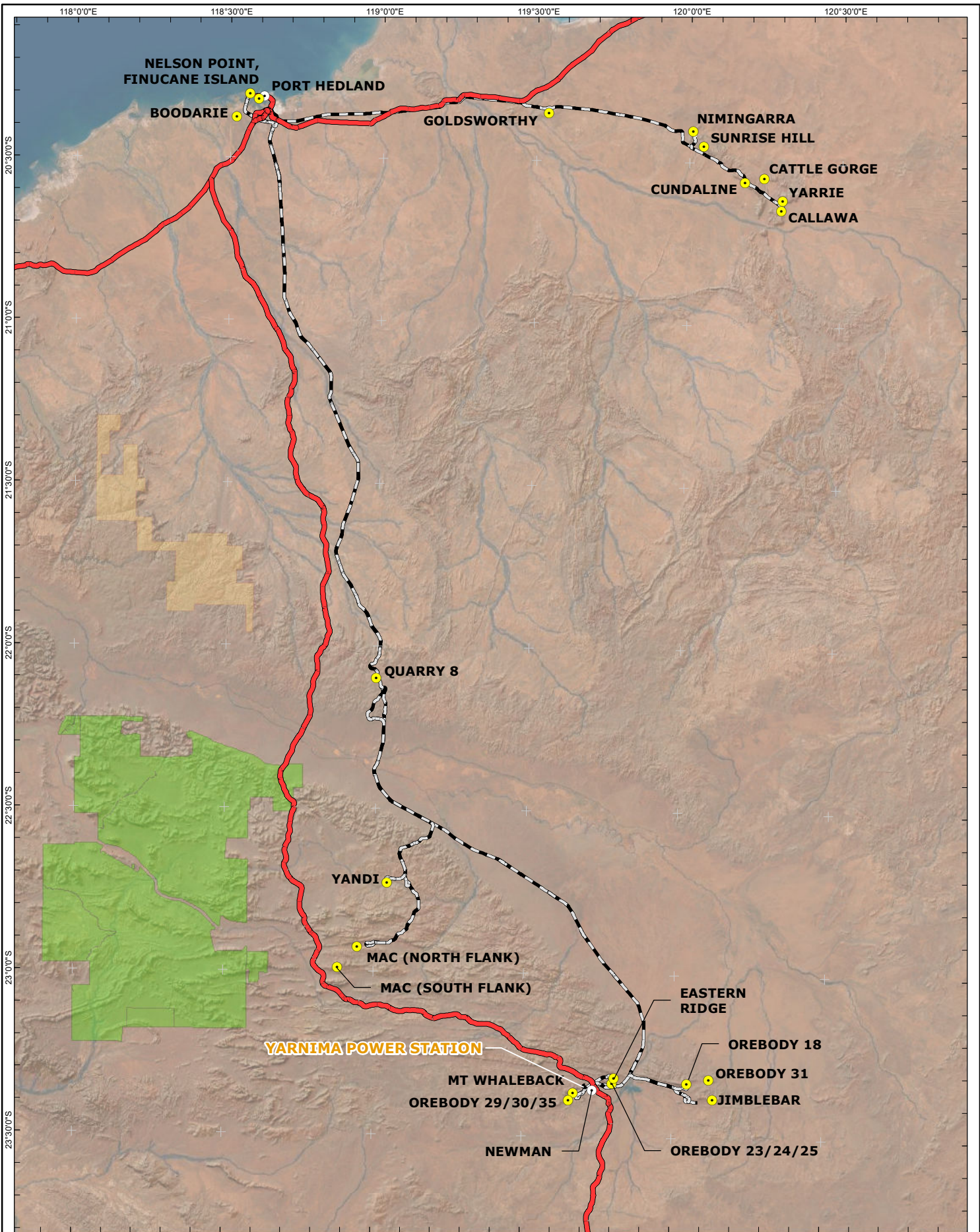
This document is provided as a supplementary report to the referral of a significant proposal under Section 38 of the *Environmental Protection Act 1986* (EP Act). As provided for in the *Environmental Impact Assessment (Part IV Divisions 1 and 2) Procedures Manual* (Environmental Protection Authority (EPA) 2021a), where a proponent aims to provide sufficient information with the referral to enable the EPA to set 'Referral Information' as the level of assessment, the proponent may prepare a supplementary report/s for the referral consistent with the requirements of an Environmental Review Document (ERD).

The scope of this document is an assessment of the potential significant environmental impacts from the Proposal, which comprises an increase in installed firm power generation capacity at the Yarnima Power Station (YPS) from 154 megawatts (MW) (comprised of 119 MW gas and 35 MW diesel) up to 239 MW via installation and operation of gas reciprocating engines (GREs) (up to 120 MW) and associated infrastructure. This document and supporting information comprises the following:

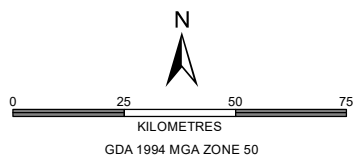
- ERD for the Proposal – main document.
- Proposal Content Document (Appendix 1).
- Supporting study reports (Appendix 2 to Appendix 5).
- Greenhouse Gas Management Plan (GHGMP) (Appendix 6).
- GHGMP Peer Review (Appendix 7).
- Closure Plan and Summary (Appendix 8).

BHPIO has considered guidance in the *Environmental Impact Assessment (Part IV Divisions 1 and 2) Procedures Manual: Requirements under the Environmental Protection Act 1986* (Procedures Manual) (EPA 2021a), including the following EPA Instructions, to prepare this document:

- *Referral of a proposal under section 38 of the Environmental Protection Act 1986: Instructions* (Referral Instructions) (EPA 2021b).
- *How to prepare an Environmental Review Document: Instructions* (ERD Instructions) (EPA 2021c).
- *How to identify the content of a Proposal: Instructions and template* (Proposal Content Instructions) (EPA 2021d).
- *How to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans: Instructions* (EPA 2021e).
- EPA factor guidelines and technical guidance (see details under relevant factor).



- BHP WAIO operation
- Town
- National highway
- Rail
- National park
- Nature reserve



BHP

PUBLIC

Figure 1-1
REGIONAL LOCATION

PLANNING & STANDARDS - IRON ORE		
SCALE @ A4:	1:1,700,000	FIGURE:
DATE:	13/07/2023	NO: A1157/1B
PREPARED:	SPATIAL DATA	REQUESTOR:
		ENV APPROVALS

2 Proposal

2.1 Overview

The power demand of BHPIO's Western Australia operations is forecast to increase from approximately 150 MW to around 1 GW by 2040. The additional power is required to support electrification of BHPIO's rail and mining fleet as well as iron ore production. The power demand increase is forecasted to occur while BHPIO transitions to renewable energy sources.

BHPIO proposes to increase power generation at the existing Yarnima Power Station (YPS) through installation and operation of gas reciprocating engines (GREs). The Proposal will displace existing higher emission diesel generation⁴, and this is expected to occur by 2027.

Implementation of the Proposal will ultimately enable renewable energy sources to be built and integrated into the power network to support BHPIO's operations. Due to the intermittent nature of renewable power generation, the responsive and efficient GREs will provide the necessary stability in BHPIO's Inland Power Grid during periods of lower renewable power generation.

The implementation of the Proposal will bring BHPIO in line with industry best practice.

2.2 Proposal content

The Proposal content description and elements are described in the separate Proposal Content Document (Appendix 1), as required by the *Instructions: How to identify the content of a Proposal* (EPA 2021d).

The Proposal is located on highly disturbed land adjacent to the existing YPS, within BHPIO's Mineral Lease ML244SA. The Proposal elements will be constructed within a 47 ha Development Envelope, within which 4 ha of native vegetation will be cleared for the indicative footprint and an associated laydown area for construction. This clearing is already approved under the existing Native Vegetation Clearing Permit (NVCP) (CPS 5617/5). The Development Envelope and indicative footprint are shown on Figure 2-1.

2.3 Existing project

BHPIO owns and operates the YPS located in Newman (Figure 2-1). YPS is the central element in an islanded grid that supplies electricity to BHPIO's central and eastern iron ore mining hubs, and the town of Newman.

The existing YPS has a firm capacity of 154 MW and comprises of:

- three 32 MW Combined Cycle Gas Turbines (CCGTs) connected to three Heat Steam Recovery Generators (HRSGs).
- two 40 MW steam turbine generators powered by the HRSGs.
- 35 MW diesel fired temporary power station.
- transmission lines, switchrooms and switch gear.
- three black start diesel generators.

⁴ Diesel generation will be required as a contingency including in an emergency and during maintenance campaigns.

- two 800 kl diesel storage tanks.
- stormwater treatment and drainage system.

2.4 Exclusions from the Proposal

The existing YPS is excluded from the Proposal. The Proposal comprises an expansion of the YPS via an increase in firm power generation from 154 MW up to 239 MW through installation and operation of GREs (up to 120 MW) and associated infrastructure.

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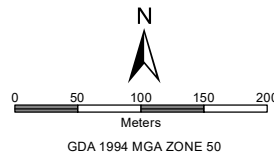
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- Indicative Footprint
- Development Envelope
- Laydown area

Newman Power Station (Alinta)



BHP

PUBLIC

Figure 2-1
 PROPOSED DEVELOPMENT ENVELOPE
 AND INDICATIVE FOOTPRINT

PLANNING & STANDARDS - IRON ORE

SCALE @ A4:	1:6,000	REQUESTED:	WAIO Environmental Approvals
DATE:	14/06/2023	PREPARED:	Spatial Data
		REVIEWED:	

A1157-005 RevA

2.5 Proposal alternatives

BHPIO's select energy solution for this approval is for the existing Yarnima Power Station's CCGTs to operate with the proposed GREs by 2027. Additional power generation projects aligned with BHPIO's decarbonisation strategy will be required beyond this time, with the considered renewable energy projects enabled by the Proposal.

2.5.1 Renewable Energy

Renewable power generation, such as solar and wind and associated infrastructure, is being actively considered by BHP (2023, BHP). Installing renewable generation on its own was not considered a viable alternative to the Proposal at this stage, for the following reasons:

- Intermittency in generation, solar cannot provide power at night and wind is not always steady to meet forecast demand.
- As future renewable projects come online, GREs will be able to rapidly ramp up and down to support intermittent renewable generation. Rapid response to renewable generation enables better penetration of renewable power as well as more efficient use of gas.
- Battery storage can provide peaking and firming support, however, is not able to provide baseload power to meet demand.
- Other technological solutions were either not considered viable enough for use in the Pilbara or would take a long-time to construct. This includes large scale storage and long-duration energy storage.

GREs will enable the BHPIO inland power grid to provide firm baseload power, respond rapidly to intermittency issues associated with the introduction of renewable energy and support higher power demands from planned electrification of mining and rail operations.

2.5.2 Diesel Generation

An alternative considered to the Proposal was for the peak power demand of 239 MW to be fulfilled by a combination of diesel and gas-fired power generation.

The alternative assessed was the combined power generation from the existing Yarnima Power Station's CCGTs (firm capacity of 119 MW) and diesel-fired temporary power station (firm capacity of 35 MW), MAC diesel power station (firm capacity of 10 MW), with new GREs providing the incremental generation (75 MW).

To understand the difference in GHG emissions between this alternative and the selected energy solution, BHPIO commissioned GHD to prepare a detailed GHG emissions calculation report (GHD 2023).

The estimated difference in GHG emissions between this alternative (referred to as the 'Reference Scenario') and the selected energy solution (the 'Proposal Scenario') is shown in Appendix 9. The Reference Scenario results in an additional 3,096,300 tCO₂-e of total Scope 1 emissions, equivalent to 119,085 tCO₂-e Scope 1 emissions per annum. This is approximately 10.9% more than the Proposal Scenario.

This alternative was deemed an inadequate long-term solution due to the higher GHG emissions of diesel generation relative to the proposed GREs.

2.6 Local and regional context

The Proposal is situated in the town of Newman, where iron ore mining is the dominant land use in the local area (Figure 2-2). Existing local contributors to GHG emissions include, but are not limited to, power generation for town and mine supply, and diesel consumption for mining and vehicle users.

The Development Envelope is located within the Yarnima Power Station and is situated within BHPIO's tenements ML244SA and E52/2009. The Yarnima Power Station is adjacent to the existing Newman Power Station operated and run by Alinta Energy.

The Development Envelope is located within the upper Fortescue River catchment. There are no permanent watercourses or water bodies within a 1 km radius of the Development Envelope. There is one ephemeral drainage line (Whaleback Creek) located approximately 200 m to the south-east.

The Development Envelope does not intersect any published environmentally sensitive areas or conservation areas. The Ethel Gorge aquifer stygobiont Threatened Ecological Community (TEC) is located approximately 6 km to the east of the Development Envelope, and Fortescue Marsh lies 85 km to the north. The nearest conservation reserve is Karijini National Park, located approximately 120 km to the north-west.



- Town
- BHP WAIO operation
- Major Aircraft Facility
- Highways
- Rail
- Ophthalmia Dam
- National park
- Development Envelope
- E52/2009-1
- ML244SA

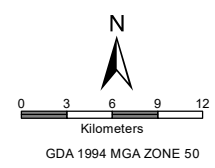


Figure 2-2
LOCAL CONTEXT

PLANNING & STANDARDS - IRON ORE

SCALE @ A4: 1:500,000 REQUESTOR: Env Approvals FIGURE:
 DATE: 14/06/2023 PREPARED: Spatial Data

3 Legislative context

3.1 Environmental impact assessment process

3.1.1 EP Act

3.1.1.1 Yarnima Power Station approvals history

The initial construction of the YPS (Stage 1) was undertaken via a Works Approval and Licence (L8803/2013/1) under Part V of the EP Act in November 2011 and February 2014 respectively. Stage 1 involved the construction of a single open cycle gas turbine with a derated capacity of 38 megawatts electric (MWe) and was not referred to the EPA under Part IV of the EP Act based on the scale of the operation and negligible potential environmental impacts. In 2013, BHPIO applied to amend the Works Approval to extend the commissioning period from three to nine months. The amendment was granted on the 02 May 2013. A Licence (L8803/2013/1) for Stage 1 was granted on the 27 February 2014.

In 2012 BHPIO identified the need to further expand YPS (Stage 2) by installing two new gas turbines, three heat recovery steam generators and two steam turbines to increase the total capacity of YPS. BHPIO referred Stage 2 to the EPA under Part IV of the EP Act on the 05 April 2012. On the 07 May 2012, BHPIO received notice that the EPA had decided not to assess Stage 2. A Works Approval application to construct Stage 2 was granted in November 2012 and the amended Licence L8803/2013/1 was granted in September 2015.

3.1.1.2 Current Part IV referral

BHPIO has determined that the Proposal is potentially significant and requires referral to the EPA under Part IV, Section 38 of the EP Act. Should the EPA decide to assess the Proposal, BHPIO considers that a level of assessment of 'Assess on Referral Information' is appropriate. BHPIO has undertaken a comprehensive environmental impact assessment, documented in this report and supporting appendices.

3.1.2 State Agreement

The YPS is operated in accordance with the *Iron Ore (Mount Newman) Agreement Act 1964* (WA), and approval under this State Agreement will be required for the Proposal and sought separately.

3.1.3 State Strategic Approval

BHPIO has an approved Strategic Proposal under Ministerial Statement (MS) 1105 pursuant to Part IV of the EP Act. The Strategic Proposal allows for Derived Proposals to be referred provided that the Proposal meets the consideration requirements under the EP Act.

Yarnima Power Station was determined to not have been contemplated in the MS 1105 decision, hence a link could not be established between gas fired electricity generation and MS 1105. Considering this, BHPIO has decided to not request that the Proposal be declared a Derived Proposal under MS 1105.

3.1.4 Commonwealth Strategic Approval

BHPIO has a strategic approval under Part 10 of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The BHPIO Pilbara Strategic Assessment Program (the Program) was endorsed by the Commonwealth Minister for the Environment and Energy on 11 May 2017 and an Approval (the Strategic Approval) for taking actions in accordance with the Program was issued on 19 June 2017. The approval covers future activities (actions) within the Strategic Assessment Area, which is the same as the State Strategic Proposal boundary. The Proposal is located within the Strategic Assessment Area.

The relevant Program Matters (Matters of National Environmental Significance – MNES) comprise the following threatened fauna species: Greater Bilby (*Macrotis lagotis*), Pilbara Olive Python (*Liasis olivaceus barroni*), Pilbara Leaf-nosed Bat (*Rhinonicteris aurantia*), Northern Quoll (*Dasyurus hallucatus*), Ghost Bat (*Macroderma gigas*), Grey Falcon (*Falco hypoleucos*) and Night Parrot (*Pezoporus occidentalis*).

All actions covered by the Strategic Approval must be taken in accordance with the endorsed Program. BHPIO administers a non-statutory validation decision process under Part C of the Program to decide whether an action will have an impact on Program Matters. BHPIO has concluded that the Proposal is not likely to have a relevant impact on a Program Matter based on an assessment of the proposed activity against the thresholds defined for Program Matters under Part C of the Program. Subsequently, BHPIO has decided that the Proposal is not a notifiable action and will prepare a Decision Report to document the decision prior to works commencing.

3.2 Other approvals and regulation

The YPS is situated within Mineral Lease ML244SA and falls within the Nyiyaparli Native Title Determination Area. ML244SA is within the scope of the agreement between BHPIO and the Karlka Nyiyaparli Aboriginal Corporation.

Table 3-1 outlines other state approvals that are required for the Proposal.

Table 3-1: Other approvals

Decision-making authority	Legislation or Agreement regulating the activity	Approval required (and relevant proposal element)	Statutory decision-making process can mitigate impacts on the environment?
Chief Executive Officer (CEO), Department of Water and Environmental Regulation (DWER)	EP Act – Part V	Works Approval and Licence amendments required (electric power generation, bulk storage of chemicals)	Yes Existing Licence (L8803/2013/1) contains limits and conditions to mitigate impacts on the environment in respect of air quality and noise. The amendment will capture and require management of the increased power generation and bulk storage of chemicals.
Minister for State Development	<i>Iron Ore (Mount Newman) Agreement Act 1964</i> (WA)	State Agreement amendment	No

4 Stakeholder engagement

4.1 Key stakeholders

During the development of the Proposal, BHPIO undertook targeted stakeholder engagement based on interest and proximity to the Development Envelope. The key stakeholders for the Proposal are summarised in Table 4-1.

Table 4-1: Key stakeholders

Stakeholder group	Stakeholder
State Government	DWER – EPA Services
Traditional Owners, Native Title Claimants and Representative Bodies	Nyiyaparli Native Title Holders Karlka Nyiyaparli Aboriginal Corporation
Local Government	Shire of East Pilbara

4.2 Stakeholder engagement process and outcomes

BHPIO meets regularly with the key stakeholders identified in Table 4-1 to understand expectations, concerns and interests. Table 4-2 summarises stakeholder engagement undertaken for the Proposal. BHPIO will remain available for stakeholder engagement during and post the assessment of the Proposal.

Table 4-2: Stakeholder engagement

Stakeholder	Date	Topics/issues raised	BHPIO 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.	This is addressed 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 localised outages was not certain.

5 Object and principles of the EP Act

The Object of the EP Act (s4A) is to protect the environment of the State, having regard to the principles in s4A of the EP Act. Table 5-1 outlines BHPIO's consideration of the Object and principles of the EP Act in relation to the Proposal.

Table 5-1: Object and principles of the EP Act

Principle	Consideration
<p>1. The precautionary principle</p> <p><i>Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.</i></p> <p><i>In application of this precautionary principle, decisions should be guided by:</i></p> <p>(a) <i>careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and</i></p> <p>(b) <i>an assessment of the risk-weighted consequences of various options.</i></p>	<p>BHPIO has considered the precautionary principle during its assessment of potential significant impacts from the Proposal. BHPIO acknowledges the uncertainty around specific threats and impacts to WA's environment from GHG emissions. The GHGMP will ensure GHG emissions from the Proposal are managed to minimise the risk of environmental harm so far as reasonably practicable.</p> <p>BHPIO considers the implementation of the Proposal is a key step forward on the pathway to decarbonisation and establishing renewable energy as the future primary source of electricity across BHPIO's Western Australia operations.</p>
<p>2. The principle of intergenerational equity</p> <p><i>The present generation should ensure that the health, diversity and productivity of the environment is maintained and enhanced for the benefit of future generations.</i></p>	<p>BHPIO recognises climate change poses a risk to future generations. The mitigation measures outlined in Section 8 demonstrate the ways in which BHPIO will minimise GHG emissions as far as reasonably practicable for the Proposal. BHPIO will also utilise offsets for the Proposal, should they be required.</p>
<p>3. The principle of the conservation of biological diversity and ecological integrity</p> <p><i>Conservation of biological diversity and ecological integrity should be a fundamental consideration.</i></p>	<p>The Proposal elements will be constructed within a 47 ha Development Envelope, within which 4 ha of native vegetation is required to be cleared. The clearing of this vegetation is approved under the existing Mount Whaleback NVCP (CPS 5617/5). During assessment of the NVCP application, potential impacts to biological factors were assessed for the broader Mount Whaleback NVCP area (within which the Development Envelope falls) via assessment against the Clearing Principles.</p> <p>The indicative footprint is located on highly disturbed land adjacent to the existing YPS. Clearing is therefore considered unlikely to impact biological diversity or ecological integrity.</p> <p>BHPIO acknowledges that climate change can affect biological diversity and ecological integrity, and therefore the GHG or other emissions to air from the Proposal have the potential to impact the environment. However, the mitigation measures proposed are considered to minimise the risk of environmental harm and impacts on the conservation of biological diversity and ecological integrity.</p>
<p>4. Principles relating to improved valuation, pricing and incentive mechanisms</p> <p>(1) <i>Environmental factors should be included in the valuation of assets and services.</i></p>	<p>BHPIO acknowledges the need to assess environmental factors against asset valuation, pricing and incentive mechanisms and strives to pursue these principles when practicable. Some of the approaches BHPIO is taking for the Proposal include:</p>

Principle	Consideration
<p>(2) <i>The polluter pays principles – those who generate pollution and waste should bear the cost of containment, avoidance and abatement.</i></p> <p>(3) <i>The users of goods and services should pay prices based on the full life-cycle costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste.</i></p> <p>(4) <i>Environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, which enable those best placed to maximise benefits and/or minimise costs to develop their own solutions and responses to environmental problems.</i></p>	<ul style="list-style-type: none"> • Where structural abatement of emissions is insufficient to meet the Proposal’s emission reduction targets, BHPIO will ensure that these targets are met by either using banked Safeguard Mechanism Credits (SMC’s) from prior years, transferring SMC’s from other BHPIO facilities (to allow for cost-efficient decarbonisation), and/or retiring eligible, high-quality carbon 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. • Reviewing decarbonisation plans annually as part of BHPIO’s capital allocation process, to take into account studies of potential decarbonisation initiatives conducted by BHPIO or others to assess the technology readiness, abatement efficiency, ease of operational integration and other relevant factors. • Prioritising the Proposal as a key step towards decarbonisation at BHPIO’s Western Australian operations and working towards the future development of and use of renewables.
<p>5. The principle of waste minimisation</p> <p><i>All reasonable and practicable measures should be taken to minimise the generation of waste and its discharge into the environment.</i></p>	<p>Standard waste management measures are a key element for the implementation of this Proposal. It is standard practice for BHP to apply the waste management hierarchy to all sites and this will be the case in relation to this Proposal (i.e. avoidance, reuse, recycling, recovery of energy, treatment, containment and disposal).</p> <p>The mitigation measures proposed are such that the generation of waste and its discharge to the environment from the Proposal will be minimal.</p> <p>The GHGMP for the Proposal (Appendix 6) demonstrates further how the principle of waste minimisation will be met.</p>
<p>Description of how the Object of the EP Act has been considered:</p> <p>The Object of the EP Act is ‘to protect the environment of the State’, having regard to the five principles outlined above. BHPIO has considered this Object by addressing each of the principles above, in terms of the potential impacts the Proposal could have on the environment of the State.</p>	

6 Environmental factors

BHPIO considered the various matters that the EPA may have regard to in considering the significance of potential impacts, as outlined in the EPA's Procedures Manual (2021a) and *Statement of environmental principles, factors, objectives and aims of EIA* (EPA 2023a). Table 6-1 summarises whether BHPIO has identified that an environmental factor is a preliminary key environmental factor (i.e. those factors that may be significantly impacted by the Proposal) for the assessment.

Table 6-1: Identification of preliminary key environmental factors

Environmental factor	Potential environmental impacts	Preliminary key environmental factor for the Proposal
Land		
Flora and Vegetation	The Proposal is located on highly disturbed land adjacent to the existing YPS, within BHPIO's Mineral Lease ML244SA. The Proposal elements will be constructed within a 47 ha Development Envelope, within which approximately 4 ha of native vegetation will be cleared. This clearing is already approved under an existing NVCP (CPS 5617/5).	No
Terrestrial Fauna	As above, approximately 4 ha of native vegetation is proposed to be cleared. This vegetation is already degraded due to the proximity to the existing power station and mining operations and does not represent habitat that supports significant fauna values.	No
Subterranean Fauna	The Proposal does not include any activities with the potential to significantly impact subterranean fauna.	No
Landforms	The Proposal does not include any activities with the potential to significantly impact landforms.	No
Terrestrial Environmental Quality	The Proposal does not include any activities with the potential to significantly impact terrestrial environmental quality.	No
Water		
Inland Waters	There are no permanent watercourses or water bodies within a 1 km radius of the Proposal. There is one ephemeral drainage line (Whaleback Creek) located approximately 200 m to the south-east. The Proposal does not include any activities which could potentially impact inland waters.	No
Air		
Air Quality	The Proposal is predicted to result in Nitrogen dioxide (NO ₂) emissions into the air; however, the predicted impacts from the Proposal are not significant such as to warrant Air Quality being considered as a preliminary key environmental factor. Air quality for the existing YPS is also managed under the existing Part V Licence. An amendment will be sought to account for the Proposal.	No (See Section 8)
Greenhouse Gas Emissions	The EPA's <i>Environmental Factor Guideline – Greenhouse Gas Emissions</i> (EPA 2023b) indicates that generally, GHG emissions from a proposal will be considered where they are reasonably likely to exceed 100,000 tonnes CO ₂ -e of Scope 1 or 2 emissions in any year. The Proposal will exceed 100,000 tonnes CO ₂ -e of Scope 1 emissions annually. There are no Scope 2 emissions associated with the Proposal.	Yes (Section 7)

Environmental factor	Potential environmental impacts	Preliminary key environmental factor for the Proposal
People		
Social Surroundings	The Proposal will be built and operated within an existing power station in the town of Newman. The Proposal will result in noise emissions which will be managed through appropriate controls to ensure compliance with the <i>Environmental Protection (Noise) Regulations 1997</i> . Noise emissions for the existing YPS are also managed under the existing Part V Licence. An amendment will be sought to account for the Proposal. Therefore, Social Surroundings is not a key or other environmental factor for this assessment.	No (See Section 8)

7 Greenhouse Gas Emissions

7.1 EPA Environmental factor and objective

The EPA’s objective for the Greenhouse Gas Emissions factor is:

To minimise the risk of environmental harm associated with climate change by reducing greenhouse gas emissions as far as practicable.

7.2 Relevant policy and guidance

BHPIO assessed this environmental factor consistent with the following relevant EPA policies and guidance, as outlined in Table 7-1.

Table 7-1: Greenhouse gas emissions – policy and guidance

EPA (and other State) policy and guidance	Consideration of EPA policy and guidance
<p><i>Environmental Factor Guideline – Greenhouse Gas Emissions (EPA 2023b)</i></p>	<p>BHPIO has considered the guideline and has addressed the requirements as follows:</p> <ul style="list-style-type: none"> • Credible estimates of GHG emissions: The estimated Scope 1 and Scope 3 emissions (annual and total) are presented in Sections 7.4.1.2 and 7.4.1.3. There are no Scope 2 emissions associated with the Proposal. • Scope 1 emissions estimates must include all emissions caused as a direct result of the Proposal: Scope 1 emissions from the Proposal are related to generation of electricity only. Emissions associated with clearing of vegetation and construction activities are presented in the GHGMP for completeness. However, as these are considered insignificant, they have been excluded from the overall emissions estimates presented in this ERD. • GHG emissions by source: A breakdown of GHG emissions by source for the Proposal is presented in Sections 7.4.1.2 and 7.4.1.3. • Projected emissions intensity: Projected emissions intensity of the Proposal is presented in Section 7.4.1.4. • The GHGMP for the Proposal is provided as Appendix 6, and the peer review of the GHGMP provided as Appendix 7.
<p><i>WA Government’s Greenhouse Gas (GHG) Emissions Policy for Major Projects (Government of WA 2019)</i></p>	<p>The policy supports proponents of major new projects or project expansions that emit significant GHG emissions to develop GHGMPs that detail their contribution towards achieving the State’s aspiration of net zero emissions by 2050.</p> <p>The GHGMP for the Proposal is provided as Appendix 6.</p>
<p><i>Western Australian Climate Policy (Government of WA 2020)</i></p>	<p>BHPIO supports and is aligned with this policy to transition to the goal of net zero emissions by 2050 as implementation of the Proposal will enable future renewable energy projects in Western Australia.</p>

7.3 Receiving environment

7.3.1 Studies

Table 7-2 summarises the study undertaken to support the assessment of the Greenhouse Gas Emissions factor for the Proposal. Other supporting information is referenced in this document, where relevant.

Table 7-2: Greenhouse gas emissions – studies

Title	Date	Summary	Appendix
Yarnima Stage 4 (Gas Reciprocating Engines) Emissions Calculations Report (GHD 2023)	September 2023	The emissions calculation report sets out the methodology, assumptions, inputs and results of the forecast Scope 1 emissions calculation completed for the Proposal.	Appendix 2

BHPIO considers that this study meets the relevant EPA guidance to support the assessment of the Greenhouse Gas Emissions factor for the Proposal.

7.3.2 Environmental values

The Proposal will be situated within an existing power station, located 2 km to the north-west of Newman in the Shire of East Pilbara. Iron ore mining is the dominant land use in the local area. Existing local contributors to GHG emissions include, but are not limited to, power generation for town and mine supply, diesel consumption for mining and vehicle users.

7.4 Potential environmental impacts

7.4.1 Emission of greenhouse gases

The Proposal will emit Scope 1 and Scope 3 GHG emissions. A detailed GHG emissions calculation report has been prepared by GHD (2023). There are no Scope 2 emissions associated with the Proposal as it involves power generation, BHPIO does not anticipate sourcing any electricity from third parties with associated Scope 2 emissions.

The sources of the GHG emissions associated with the Proposal include:

- Combustion of natural gas for power generation (Scope 1).
- Land clearing and diesel combustion for construction (Scope 1).
- Supply of gas fuel for the Proposal (Scope 3).

7.4.1.1 Load forecast and emissions scenarios

The future estimated electricity load forecast expected to support growth of BHPIO's operations and planned electrification of fleet and rail network, has been calculated by GHD (2023).

The forecast estimated electricity loads assume the Proposal will operate at nameplate capacity from 2031 with other projects, primarily renewable energy (still to be developed), supplying the additional power generation required.

Appendix 2 provides further detail on the assumptions and methodology utilised for estimating GHG emissions for the Proposal.

7.4.1.2 Estimated Scope 1 emissions

Proposal Emissions

The estimated Scope 1 GHG emissions for the Proposal are presented in Table 7-3. Average annual emissions are estimated to be 454,649 tCO₂-e and total emissions are estimated to be 11,820,870 tCO₂-e. The Scope 1 emissions will be produced for the Proposal from 2027 onwards because the GREs will not be in service until that year.

Construction-related emissions caused by vegetation clearing and diesel consumption were calculated to be minor and have not been included in Table 7-5 due to their relative insignificance.

Table 7-3: Estimated Scope 1 emissions from the Proposal (GHD 2023)

Year	Scope 1 emissions (tonnes of Carbon Dioxide equivalent (tCO ₂ -e))
2027	169,050
2028	268,610
2029	380,750
2030	441,800
2031	480,030
2032	480,030
2033	480,030
2034	480,030
2035	480,030
2036	480,030
2037	480,030
2038	480,030
2039	480,030
2040	480,030
2041	480,030
2042	480,030
2043	480,030
2044	480,030
2045	480,030
2046	480,030
2047	480,030
2048	480,030
2049	480,030
2050	480,030
2051	480,030
2052	480,030
TOTAL Scope 1 emissions	11,820,870
Average annual Scope 1 emissions⁵	454,649

⁵ Annual average emissions determined for the period 2027 to 2052, excluding the period that GREs associated with the Proposal will not be operating 2024 to 2026.

Cumulative emissions

The cumulative Scope 1 emissions estimates have been calculated for the combined YPS existing gas turbines and the Proposal, which together will supply BHPIO's forecast electricity requirements in the lead up to the inclusion of renewables. Total cumulative emissions are estimated at 23,831,630 tCO₂-e, with an average annual emissions of 916,601 tCO₂-e (Table 7-4).

7.4.1.3 *Estimated Scope 3 emissions***Proposal Emissions**

The estimated Scope 3 GHG emissions for the Proposal are presented in Table 7-5. Scope 3 emissions for the Proposal are the emissions associated with supplying fuel (natural gas) for the Proposal only.

Table 7-5: Estimated Scope 3 emissions from the Proposal only (GHD 2023)

Year	Scope 3 emissions (tCO ₂ -e)
2027	13,120
2028	20,850
2029	29,560
2030	34,290
2031	37,260
2032	37,260
2033	37,260
2034	37,260
2035	37,260
2036	37,260
2037	37,260
2038	37,260
2039	37,260
2040	37,260
2041	37,260
2042	37,260
2043	37,260
2044	37,260
2045	37,260
2046	37,260
2047	37,260
2048	37,260
2049	37,260
2050	37,260
2051	37,260
2052	37,260
TOTAL Scope 3 emissions	917,540
Average annual Scope 3 emissions	35,290

Cumulative Emissions

The cumulative Scope 3 emissions estimates have been calculated for the combined YPS existing gas turbines and the Proposal. Total cumulative emissions are estimated at 1,849,870 tCO₂-e, with an average annual emissions of 71,149 tCO₂-e (Table 7-6).

7.4.1.4 Emissions intensity and benchmarking

The forecast emissions intensity associated with the Proposal Scenario is outlined in Table 7-7.

Table 7-7: BHPIO power generation emissions intensity for the Proposal scenario

Year	Emission intensity (tCO ₂ -e/ MWh)
2024	0.45
2025	0.46
2026	0.47
2027	0.45
2028	0.45
2029	0.45
2030	0.46
2031	0.46
2032	0.46
2033	0.46
2034	0.46
2035	0.46
2036	0.46
2037	0.46
2038	0.46
2039	0.46
2040	0.46
2041	0.46
2042	0.46
2043	0.46
2044	0.46
2045	0.46
2046	0.46
2047	0.46
2048	0.46
2049	0.46
2050	0.46
2051	0.46
2052	0.46

YPS is a highly efficient combined cycle gas turbine power station which emits approximately 35% less carbon dioxide than the Australian average, achieved through waste-heat recovery. Table 7-8 summarises the benchmarking assessment of the Proposal Scenario to comparable power stations located in the Pilbara region. 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 power stations operating in similar high ambient temperature conditions.

Table 7-8: Emissions intensity of other power stations in the Pilbara 2020-2021 (GHD 2023)

Facility	Emission intensity (t CO ₂ -e/ MWh)
The Proposal Scenario estimated average (2024 – 2052)	0.46
Existing Yarnima Power Station	0.46
South Hedland Power Station	0.52
Paraburdoo Power Station	0.54
West Angelas Power Station	0.56
Yurralyi Maya Power Station	0.58
Cape Lambert Power Station	0.59
Solomon Power Station	0.61
Karratha Power Station	0.7
Newman Power Station	0.7
Port Hedland Power Station	0.75

7.5 Mitigation

7.5.1 Avoid

The Proposal is forecast to displace diesel emissions at BHPIO operations through provision of high efficiency gas-powered electricity. Given diesel combustion generates more GHG emissions, displacing diesel electricity generation with gas generation is estimated to result in 3,096,200 tCO₂-e of Scope 1 emissions avoided over the life of the Proposal, which is equivalent to 119,085 tCO₂-e Scope 1 emissions avoided annually. Appendix 9 contains a detailed year-on-year breakdown of avoided emissions.

The emissions intensity for Scope 1 emissions associated with the Proposal is estimated to be approximately 0.46 t CO₂-e / MWh of electricity generated. This is approximately 30% lower than the 2022 Australian average of 0.65 t CO₂-e / MWh (2023, DCCEEW), other Australian power stations were also used in benchmarking (Appendix 6).

7.5.2 Reduce

BHPIO will implement the GHGMP for the Proposal (Appendix 6) which outlines:

- BHP's commitment to achieving net-zero operational emissions (Scope 1 and Scope 2) by 2050⁶.
- BHPIO's contribution towards the Western Australian Government's aspiration of net zero emissions by 2050, in relation to GHG emissions as outlined in the State GHG Policy and Guideline.
- the consideration given to evolving state and national policy settings, including new international commitments.
- how the Proposal will enable BHPIO to transition to renewables in the Pilbara.
- how compliance with the Commonwealth Government's Safeguard Mechanism will demonstrate progressive reduction in Scope 1 emissions arising from the Proposal.
- that all reasonable and practicable measures have been applied to mitigate Scope 1 emissions from the Proposal.
- how GHG emissions from the existing YPS and the Proposal are monitored and managed to minimise contribution to state and national GHG emissions.

7.5.3 Offsets

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

The reformed Safeguard Mechanism allows for a range of flexible compliance arrangements, including the generation of Safeguard Mechanism Credits (SMCs) when emissions are below baselines (and which can be banked or traded within safeguard facilities), the purchase and surrender of Australian Carbon Credit Units (ACCUs) to reduce net emissions.

Although BHP prioritises internal emissions reduction, it acknowledges a role for the use of flexible compliance arrangements that are allowed under the reformed Safeguard Mechanism.

This means that where structural abatement of emissions is insufficient to meet the Proposal's emission reduction trajectory, BHP will ensure that these targets are met by either using banked SMCs from prior years, transferring

⁶ Our long-term goal is to achieve net zero operational emissions by 2050, as stated in the BHP Climate Transition Action Plan 2021.

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.

BHP mitigates 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 BHP's anticipated demand for offsets over time, as it works to decarbonise its 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 BHP has continued access to security of supplies.

In the context of BHP's operations in Western Australia, including the operations within the Proposal, BHP's preference is to source offsets in line with its operational footprint in Western Australia and in recognition of the WA state government's preference for locally generated offsets. BHP 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 its tenure (including mineral carbonation and natural climate solutions), as well as exploring opportunities outside of its 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, BHP sources 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 Proposal, 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 it invests in carbon offsets that meet the following minimum quality standards:

- Satisfies national carbon offset standards for compliance offsets (i.e. ACCUs 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.

BHP regularly reviews its 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 2022b).

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 BHP launched a grants program to help drive the development of the Australian blue carbon market and have provided over AUD\$5million to support emerging blue carbon methods and projects.

7.5.4 Other statutory decision-making processes

Table 7-9 summarises whether another statutory decision-making process can mitigate the potential environmental impacts of the Proposal on the Greenhouse Gas Emissions factor, considering the *Taking decision making processes into account in EIA: Interim Guidance* (EPA 2021f). Table 7-9 also provides reasons, including how, in relation to the specific potential impacts of the Proposal, the decision-making process meets the EPA’s objective for Greenhouse Gas Emissions.

Table 7-9: Greenhouse gas emissions – other statutory decision-making processes

Potential impact	Statutory decision-making process can mitigate impacts on the environment?	Reasons (if yes)
Generation of GHG Emissions	Yes	<p>NGER Act</p> <ul style="list-style-type: none"> • Provides for reporting of emissions and where these emissions exceed the defined thresholds, BHPIO will be required to undertake action to manage these emissions. <p>NGER Safeguard Mechanism</p> <ul style="list-style-type: none"> • Imposes limits and annual reporting requirements on large GHG emitting facilities to keep net emissions below a defined baseline. <p>Renewable Energy Target (Renewable Energy (Electricity) Amendment Act 2015)</p> <ul style="list-style-type: none"> • Provides the mechanism for achieving emissions targets through creation and trading of renewable energy certificates. <p>Climate Change Act 2022 (Cth) (CC Act)</p>

Potential impact	Statutory decision-making process can mitigate impacts on the environment?	Reasons (if yes)
		<ul style="list-style-type: none"> The CC Act is effective from 1 July 2023 and will require the facilities it covers to be on a broad trajectory to net zero emissions by 2050.

7.5.4.1 NGER Act and Safeguard Mechanism

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 GHG emissions by 2050. The government has underlined that policies may seek to achieve more ambitious targets than the legislated level.

The CC Act was the precursor to a range of other climate-related measures, including changes to the NGER Act and Safeguard Mechanism which took effect from the 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 CO₂-e (known as the ‘hard cap’);
 - ensuring that net total Safeguard emissions decline to no more than 100 million tonnes CO₂-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 Rules 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 the Department of Climate Change, Energy, the Environment and Water (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 ACCU or SMCs may be used. Any use of carbon credits

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 ACCU's and/or SMCs surrendered by the Clean Energy Regulator (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.

Significant penalties and other enforcement options apply for failure to comply with the NGER Act and Safeguard Mechanism. The CER and government also have wide ranging tools to monitor compliance.

All BHPIO mining, power generation and rail transport activities within the scope of the Proposal are part of facilities covered by the Safeguard Mechanism. BHPIO is also required to report on Scope 1 emissions annually by NGER facility.

The NGER Act and Safeguard Mechanism now provide a contemporary, robust, transparent and enforceable legislative regime to deliver GHG emissions reductions commensurate to Australia's international obligations. This regime will cover the field in terms of GHG emissions associated with the Proposal and, as set out in this GHGMP, enable the objectives of the WA Government's Greenhouse Gas (GHG) Emissions Policy for Major Projects (GoWA 2019).

7.5.4.2 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 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 (Clean Energy Regulator 2023). Yarnima is required by the RET to surrender renewable energy certificates relative to the RPP and electricity supplied to BHPIO's mines and the Newman township.

Yarnima Power Station is covered by both the Safeguard Mechanism and RET.

7.6 Assessment and significance of residual impact

The Proposal GHG emissions exceed the EPA's Environmental Factor Guideline for Greenhouse Gas Emissions (April 2023) criteria of 100,000 tCO₂-e of Scope 1 emission in any year for consideration under Part IV of the EP Act.

The proposed Scope 1 emissions detailed in Table 7-3 equate to approximately 0.567% of state and 0.098% of national estimated average annual GHG emissions. This contribution is small at a state, national and global level.

Proposal GHG emissions will be mitigated and reported in accordance with the GHGMP. This approach ensures transparency and minimises the risk of environmental harm associated with climate change by reducing greenhouse gas emissions in line with Australia's state and national regulatory obligations.

The Proposal and BHPIO's regional GHGMP, as found in Appendix 6, have been independently verified as industry best practice for emissions reduction.

BHPIO considers that residual impacts can be appropriately managed through the regional GHGMP to achieve the EPA objective for Greenhouse Gas Emissions (Section 7.1).

7.7 Environmental outcomes

Table 7-10 summarises the environmental outcomes, proposed regulation and proposed monitoring for the residual impact of Greenhouse Gas Emissions. Detail of the proposed monitoring is set out in the GHGMP and other relevant statutory decision-making processes are discussed in Section 7.5.4.

Table 7-10 demonstrates how the EPA's objective for Greenhouse Gas Emissions (Section 7.1) will be met.

Table 7-10: Greenhouse gas emissions – environmental outcomes and proposed assurance and monitoring

Residual impact	Environmental outcome	Proposed regulation (Condition or other statutory decision-making process)	Proposed monitoring	Consistency with EPA objective
1. Generation of GHG emissions	<p>Contribution of 454,649 tCO₂-e of Scope 1 emissions per annum (on average⁷)</p> <p>Total emissions (Scope 1) of 11,820,870 tCO₂-e over the life of Proposal</p>	<p>NGER Act</p> <ul style="list-style-type: none"> Reporting of emissions from the Proposal. Defined emissions thresholds through the NGER Safeguard Mechanism. <p>Renewable Energy Target</p> <ul style="list-style-type: none"> Defined emissions targets for purchase and surrender of renewable energy certificates. <p>CC Act</p> <ul style="list-style-type: none"> Requirements for facilities to be on a broad trajectory to net zero emissions by 2050. <p>Ministerial conditions</p> <p>To be determined.</p>	<p>Annual monitoring will be conducted in accordance with the NGER Measurement Determination.</p> <p>On a 5-yearly interval, BHPIO will also report on:</p> <ul style="list-style-type: none"> total and net Scope 1 GHG emissions from each NGER facility attributable to the Proposal. carbon offsets surrendered to achieve the proportion of the baseline for each NGER facility attributable to the Proposal activities during the reporting period. the emissions intensity of the Proposal benchmarking emissions intensity against comparable facilities. a summary of GHG emission reduction and abatement measures implemented and delivered to avoid or reduce Proposal GHG emissions. technology and initiatives under development relevant to the Proposal to achieve the emissions reduction 	<p>BHPIO considers the Proposal to be consistent with the EPA’s objective for the Greenhouse Gas Emissions factor “to minimise the risk of environmental harm associated with climate change by reducing greenhouse gas emissions as far as practicable” (EPA 2023b).</p> <p>GHG emissions will be mitigated over the life of the Proposal in accordance with the GHGMP, which includes abatement measures.</p>

⁷ Annual average emissions determined for the period 2027 to 2052, excluding the period that GREs associated with the Proposal will not be operating 2024 to 2026.

Residual impact	Environmental outcome	Proposed regulation (Condition or other statutory decision-making process)	Proposed monitoring	Consistency with EPA objective
			trajectories illustrated in the GHGMP (Appendix 6).	

8 Other environmental factors

Table 8-1 presents BHPIO's evaluation of 'other environmental factors'. Air Quality and Social Surroundings (Noise) are the only other factors relevant to the Proposal. Justification is also provided below as to why BHPIO considers that these factors are not preliminary key environmental factors, and supporting information is included as Appendix 3 and Appendix 4.

Table 8-1: Other environmental factors

Relevant activities for the Proposal	Potential impacts	Justification for why factor is not considered to be a preliminary key environmental factor
Land		
Flora and Vegetation		
Clearing of native vegetation for the Proposal	Clearing of potentially environmentally significant native vegetation	<p>Significance considerations</p> <p>Aerial photography (Figure 2-1) and historical surveys (Onshore 2014) (Appendix 5) indicate that the limited area proposed to be cleared is already highly disturbed. This is due to the surrounding mining activities and being immediately adjacent to the existing Yarnima and Newman power stations. The approximate 4 ha of clearing associated with the Proposal is not considered to have a significant impact to the environment.</p> <p>Previous surveys indicate that there are no significant species or environmental values associated with the disturbance envelope.</p> <p>No avoidance or minimisation measures have been applied, given the very small footprint and current vegetation condition.</p>
AIR		
Air quality		
EPA objective: <i>To maintain air quality and minimize emissions so that environmental values are protected.</i>		
Combustion of gas for power generation	The proposal will result in Nitrogen dioxide (NO ₂) being released into the air	<p>Significance considerations</p> <p>An air quality assessment for the Proposal was undertaken by Environmental Technologies & Analytics (ETA 2024) (Appendix 3). The potential air quality impacts associated with the Proposal were assessed through comparison to relevant air quality objectives based on the National Environment Protection (Ambient Air) Measure (NEPM) (NEPC 2021). The predictions presented in the ETA (2024) report incorporate a level of conservatism in the assumptions made and the dispersion modelling approach so it is expected that actual ground-level concentrations would be lower (than modelled) for the Proposal.</p> <p>A set of discrete locations around the Newman townsite were selected as sensitive receptors for air dispersion modelling. The modelled NO₂ concentrations were predicted for two scenarios; YPS only (including the Proposal), and cumulative from YPS (including the Proposal) and the adjacent Alinta Power Station combined.</p> <p>The assessment concluded that all modelled predictions for NO₂ concentrations for normal operating conditions were below the NEPM criteria at sensitive receptor locations. There are some areas where the maximum 1-hour</p>

Relevant activities for the Proposal	Potential impacts	Justification for why factor is not considered to be a preliminary key environmental factor
		<p>average ground-level NO₂ concentrations are predicted to be above the NEPM criteria. The areas that the 99.9th percentile (9th highest) 1-hour average ground-level NO₂ concentrations are predicted to be above NEPM criteria is in the immediate vicinity of the premises boundary and not in the Newman townsite.</p> <p>Modelling predicts maximum 1-hour ground-level NO₂ concentrations are predicted to exceed NEPM criteria near a sensitive receptor (R4 – small area in the eastern residential areas of the Newman townsite) in the instance of a highly unlikely, short duration startup scenario. This is a low risk event that is based on highly conservative modelling, as explained below.</p> <p>The modelled startup operations scenario assumes startup and synchronization of the entire Proposal (up to 120 MW) within 1 hour. This is a highly unlikely event as it would require failure of the two operating gas turbines and the standby gas turbine within 1 hour. If this scenario were to occur, the GREs will be required to be started to replace lost generation. Once startup has occurred and the GREs are up to temperature, emissions will be reflective of the typical operating scenario. Hence, the startup scenario is predicted to last no longer than 1 hour.</p> <p>The startup operations scenario is considered an emergency scenario and for modelling purposes it is assumed to occur not more than once per year. The scenario has been assessed over the entire modelled period (one year) to capture adverse meteorological conditions, with modelling predicting exceedances for not more than 9 hours per year. As such, the modelling is highly conservative (over-estimates), as there is a corresponding low chance that startup operations will coincide with adverse meteorological conditions. Based on this, the likelihood of an exceedance event within the Newman townsite for the modelled startup operations is estimated at 1.2×10^{-7} (less than one in one million).</p> <p>Mitigation</p> <p>BHPIO has applied the mitigation hierarchy to the Proposal in relation to air quality as described below.</p> <p><u>Avoid</u></p> <p>By using gas rather than diesel to produce electricity, the Proposal will avoid emissions of sulfur dioxide (SO₂), carbon monoxide (CO) and particulates (PM₁₀ and PM_{2.5}).</p> <p><u>Minimise</u></p> <p>The new GREs will be operated in line with manufacturer specifications to minimise emissions of NO₂.</p> <p>The YPS is licensed under Part V of the EP Act (L8803/2013/1) and BHPIO is currently in the process of applying for an amendment to the licence to account for the Proposal. Emissions to air (including nitrogen oxides) will continue to be managed under this licence, as amended.</p> <p>Environmental Outcome</p>

Relevant activities for the Proposal	Potential impacts	Justification for why factor is not considered to be a preliminary key environmental factor
		<p>Based on the air quality modelling results (ETA 2024) showing the Proposal is not expected to adversely impact on health or amenity values of sensitive (human) receptors in the Newman townsite, and that emissions to air will be managed through Part V of the EP Act (Schedule 1 – Category 52), impacts to the Air Quality factor are unlikely to be significant. BHPIO considers the Proposal to be consistent with the EPA’s Environmental Factor Guideline – Air Quality (EPA 2020).</p>
<p>PEOPLE</p>		
<p>Social Surroundings EPA objective: <i>To protect social surroundings from significant harm.</i></p>		
<p>Noise emissions from operation of GREs</p>	<p>Noise has the potential to unreasonably interfere with the health, welfare, convenience and comfort of people in the town of Newman</p>	<p>Significance considerations</p> <p>An environmental noise assessment for the Proposal was undertaken by Talis Consultants (Talis 2024) (Appendix 4) to determine if the Proposal would comply with the Environmental Protection (Noise) Regulations 1997. The assessment utilised an ‘unmitigated noise model’ because it assumes worst-case noise emissions, where no noise controls (e.g., exhaust silencers) have been considered. This is an unrealistic worst case as the facility will be designed, constructed and operated with noise mitigation. This approach was taken to assist in determining the appropriate level of noise mitigation required (Talis 2024).</p> <p>The unmitigated modelling scenario predicted that the Yarnima Power Station (YPS) operating with the Proposal would result in noise levels within the Town of Newman exceeding the assigned levels at some of the sensitive receivers by up to 12.4 decibels (dB) during night-time hours (10pm-7am).</p> <p>However, following the application of standard noise mitigation modelling showed that the YPS operating with the Proposal is predicted to comply with the assigned noise levels at all sensitive receivers in accordance with the regulations (Talis 2024).</p> <p>Mitigation</p> <p>BHPIO has applied the mitigation hierarchy to the Proposal in relation to Social Surroundings (Noise) as described below.</p> <p><u>Avoid</u></p> <p>There are no appropriate avoidance measures as GREs inherently produce noise emissions.</p>

Relevant activities for the Proposal	Potential impacts	Justification for why factor is not considered to be a preliminary key environmental factor
		<p><u>Minimise</u></p> <p>The GREs will be operated in line with manufacturer specifications to minimise noise emissions.</p> <p>The YPS is licensed under Part V of the EP Act (L8803/2013/1) and BHPIO is currently in the process of applying for an amendment to the licence to account for the Proposal. Noise emissions are managed under the existing licence through appropriate controls including noise shielding and stack silencers and will continue to be managed going forward, accounting for the additional GREs once the amendment is approved.</p> <p>Environmental Outcome</p> <p>The noise modelling results determined that with noise controls implemented, the upgraded Yarnima Power Station (including the Proposal) is predicted to comply with the assigned noise levels at all assessed receivers (Talis 2024).</p> <p>Based on this conclusion and that noise emissions will be controlled and managed through Part V of the EP Act (Schedule 1 – Category 52) and in accordance with the Regulations, impacts to the Social Surroundings factor are unlikely to be significant. BHPIO considers the Proposal to be consistent with the EPA’s Environmental Factor Guideline – Social Surroundings (EPA 2023c).</p>
Construction and operation of the Proposal	Potential impacts to social and cultural heritage	<p>The Proposal is located in an existing industrial precinct with no predicted impact to social or cultural heritage values.</p> <p>BHPIO has engaged with KNAC on the Proposal and their comments on the draft referral and supporting documents have been addressed. On-country Social Surroundings engagement will not be undertaken for the Proposal.</p>

9 Holistic impact assessment

The EPA's *How to prepare an Environmental Review Document: Instructions* (EPA 2021c) require that where the combination of the environmental effect of two or more environmental factors or values has the potential to result in a significant impact, the ERD should provide a holistic impact assessment of the Proposal on the environment. GHG Emissions is the only preliminary key environmental factor for the Proposal and BHPIO's view is that there are not any interactions between GHG Emissions and any other factors where the combination has the potential to result in a significant impact. Therefore, BHPIO has not included a holistic impact assessment of the Proposal.

10 Cumulative impact assessment

As described in Section 7.6, the Proposal will not operate in isolation. It will form part of the Proposal Scenario which includes the YPS existing gas turbines and the Proposal, which together will supply BHPIO's forecast electricity requirements in the lead up to the inclusion of renewables. This scenario also includes diesel emissions from the MAC power station and YPS in the early stages (2024-2026), because the GREs to be installed for the Proposal will not be in service until 2027.

Cumulatively, the Proposal Scenario is estimated to generate a total of 23,831,630 tCO₂-e Scope 1 emissions and 1,849,870 tCO₂-e Scope 3 emissions (Section 7.4.1.2). The Proposal Scenario Scope 1 emissions detailed in Table 7-4 equate to approximately 1.142% of state and 0.198% of national estimated average annual GHG emissions. This contribution is small at a state, national and global level. Cumulative emissions will be mitigated in accordance with the GHGMP (Appendix 6).

11 References

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Appendices

- Appendix 1** Proposal content document
- Appendix 2** Yarnima Stage 4 (Gas Reciprocating Engines) Emissions Calculations Report (GHD 2023)
- Appendix 3** Air Quality study (ETA 2024)
- Appendix 4** Environmental Noise Assessment (Talis 2024)
- Appendix 5** Consolidated Vegetation Mapping (Onshore 2014)
- Appendix 6** Pilbara Regional GHGMP
- Appendix 7** GHGMP Peer Review (KPMG 2023)
- Appendix 8** Closure Plan and Summary

Appendix 9 Proposal alternative greenhouse gas emissions assessment

Appendix 9a: Estimated cumulative Scope 1 emissions for the Reference Scenario and Proposal Scenario (GHD 2023)

Year	Reference Scenario – Scope 1 emissions (tCO ₂ -e)					Proposal Scenario – Scope 1 emissions (tCO ₂ -e)				
	Existing YPS	Existing MAC Power Station	Yarnima diesel	Other GREs expected to meet power demand under Reference Scenario ¹	Total	Existing YPS	Existing MAC Power Station	Yarnima diesel	The Proposal (GREs)	Total*
2027	461,550	65,690	173,250	24,330	724,820	461,550	-	-	169,050	630,600
2028	461,930	67,600	222,870	92,680	845,080	461,930	-	-	268,610	730,540
2029	461,970	67,810	235,790	196,870	962,440	461,970	-	-	380,750	842,720
2030	461,970	67,820	237,110	257,110	1,024,010	461,970	-	-	441,800	903,770
2031	461,970	67,820	237,370	295,180	1,062,340	461,970	-	-	480,030	942,000
2032	461,970	67,820	237,370	295,180	1,062,340	461,970	-	-	480,030	942,000
2033	461,970	67,820	237,370	295,180	1,062,340	461,970	-	-	480,030	942,000
2034	461,970	67,820	237,370	295,180	1,062,340	461,970	-	-	480,030	942,000
2035	461,970	67,820	237,370	295,180	1,062,340	461,970	-	-	480,030	942,000
2036	461,970	67,820	237,370	295,180	1,062,340	461,970	-	-	480,030	942,000
2037	461,970	67,820	237,370	295,180	1,062,340	461,970	-	-	480,030	942,000
2038	461,970	67,820	237,370	295,180	1,062,340	461,970	-	-	480,030	942,000
2039	461,970	67,820	237,370	295,180	1,062,340	461,970	-	-	480,030	942,000
2040	461,970	67,820	237,370	295,180	1,062,340	461,970	-	-	480,030	942,000
2041	461,970	67,820	237,370	295,180	1,062,340	461,970	-	-	480,030	942,000
2042	461,970	67,820	237,370	295,180	1,062,340	461,970	-	-	480,030	942,000
2043	461,970	67,820	237,370	295,180	1,062,340	461,970	-	-	480,030	942,000

Year	Reference Scenario – Scope 1 emissions (tCO ₂ -e)					Proposal Scenario – Scope 1 emissions (tCO ₂ -e)				
	Existing YPS	Existing MAC Power Station	Yarnima diesel	Other GREs expected to meet power demand under Reference Scenario ¹	Total	Existing YPS	Existing MAC Power Station	Yarnima diesel	The Proposal (GREs)	Total*
2044	461,970	67,820	237,370	295,180	1,062,340	461,970	-	-	480,030	942,000
2045	461,970	67,820	237,370	295,180	1,062,340	461,970	-	-	480,030	942,000
2046	461,970	67,820	237,370	295,180	1,062,340	461,970	-	-	480,030	942,000
2047	461,970	67,820	237,370	295,180	1,062,340	461,970	-	-	480,030	942,000
2048	461,970	67,820	237,370	295,180	1,062,340	461,970	-	-	480,030	942,000
2049	461,970	67,820	237,370	295,180	1,062,340	461,970	-	-	480,030	942,000
2050	461,970	67,820	237,370	295,180	1,062,340	461,970	-	-	480,030	942,000
2051	461,970	67,820	237,370	295,180	1,062,340	461,970	-	-	480,030	942,000
2052	461,970	67,820	237,370	295,180	1,062,340	461,970	-	-	480,030	942,000
TOTAL*	12,010,760	1,760,960	6,091,160	7,064,950		12,010,760	-	-	11,820,870	
TOTAL* Scope 1 emissions for the Reference Scenario (i.e. if the Proposal did not proceed)					26,927,830	TOTAL* Scope 1 emissions for the Proposal Scenario (i.e. if the Proposal did proceed)				23,831,630
AVERAGE annual Scope 1 emissions for the Reference Scenario (i.e. if the Proposal did not proceed)					1,035,686	AVERAGE annual Scope 1 emissions for the Proposal Scenario (i.e. if the Proposal did proceed)				916,601

¹ For the purpose of the emissions calculations, it is assumed that GREs would be used to provide the incremental generation above the capacity of the existing diesel power stations in the Reference Scenario as this is considered best practice technology and an enabler for renewables. This allows comparison of the two scenarios and assumes:

- The avoided emissions from the Proposal Scenario assumes that the operation of both the proposed GREs and Yarnima's CCGTs continue to plan, without unforeseen or short-term generation and load demand challenges, which may include the need for additional diesel power generation in an emergency and as a contingency when gas turbine generator capacity is undergoing maintenance.
- Power generation between scenarios are equal.
- The Reference Scenario contains existing diesel, with the difference to be made up with GREs.
- The Proposal Scenario includes GREs displacing all diesel.

* Each reported value is calculated using raw data and rounded. This means the totals will not exactly equal the sum of each year.

Appendix 9b: Estimated cumulative Scope 3 emissions for the Reference Scenario and Proposal Scenario (GHD 2023)

Year	Reference Scenario – Scope 3 emissions (tCO ₂ -e)					Proposal Scenario – Scope 3 emissions (tCO ₂ -e)				
	Existing YPS	Existing MAC Power Station	Yarnima diesel	Other GREs expected to meet power demand under Reference Scenario ¹	Total*	Existing YPS	Existing MAC Power Station	Yarnima diesel	The Proposal (GREs)	Total*
2027	35,830	16,190	42,700	1,890	96,610	35,830	-	-	13,120	48,950
2028	35,860	16,660	54,920	7,190	114,630	35,860	-	-	20,850	56,710
2029	35,860	16,710	58,110	15,280	125,960	35,860	-	-	29,560	65,420
2030	35,860	16,710	58,430	19,960	130,960	35,860	-	-	34,290	70,150
2031	35,860	16,710	58,500	22,910	133,980	35,860	-	-	37,260	73,120
2032	35,860	16,710	58,500	22,910	133,980	35,860	-	-	37,260	73,120
2033	35,860	16,710	58,500	22,910	133,980	35,860	-	-	37,260	73,120
2034	35,860	16,710	58,500	22,910	133,980	35,860	-	-	37,260	73,120
2035	35,860	16,710	58,500	22,910	133,980	35,860	-	-	37,260	73,120
2036	35,860	16,710	58,500	22,910	133,980	35,860	-	-	37,260	73,120
2037	35,860	16,710	58,500	22,910	133,980	35,860	-	-	37,260	73,120
2038	35,860	16,710	58,500	22,910	133,980	35,860	-	-	37,260	73,120
2039	35,860	16,710	58,500	22,910	133,980	35,860	-	-	37,260	73,120
2040	35,860	16,710	58,500	22,910	133,980	35,860	-	-	37,260	73,120
2041	35,860	16,710	58,500	22,910	133,980	35,860	-	-	37,260	73,120
2042	35,860	16,710	58,500	22,910	133,980	35,860	-	-	37,260	73,120
2043	35,860	16,710	58,500	22,910	133,980	35,860	-	-	37,260	73,120
2044	35,860	16,710	58,500	22,910	133,980	35,860	-	-	37,260	73,120

Year	Reference Scenario – Scope 3 emissions (tCO ₂ -e)					Proposal Scenario – Scope 3 emissions (tCO ₂ -e)				
	Existing YPS	Existing MAC Power Station	Yarnima diesel	Other GREs expected to meet power demand under Reference Scenario ¹	Total*	Existing YPS	Existing MAC Power Station	Yarnima diesel	The Proposal (GREs)	Total*
2045	35,860	16,710	58,500	22,910	133,980	35,860	-	-	37,260	73,120
2046	35,860	16,710	58,500	22,910	133,980	35,860	-	-	37,260	73,120
2047	35,860	16,710	58,500	22,910	133,980	35,860	-	-	37,260	73,120
2048	35,860	16,710	58,500	22,910	133,980	35,860	-	-	37,260	73,120
2049	35,860	16,710	58,500	22,910	133,980	35,860	-	-	37,260	73,120
2050	35,860	16,710	58,500	22,910	133,980	35,860	-	-	37,260	73,120
2051	35,860	16,710	58,500	22,910	133,980	35,860	-	-	37,260	73,120
2052	35,860	16,710	58,500	22,910	133,980	35,860	-	-	37,260	73,120
TOTAL*	932,330	433,890	1,501,160	548,340		932,330	-	-	917,540	
TOTAL* Scope 3 emissions for the Reference Scenario (i.e. if the Proposal did not proceed)					3,415,720	TOTAL* Scope 3 emissions for the Proposal Scenario (i.e. if the Proposal did proceed)				1,849,870
AVERAGE annual Scope 3 emissions for the Reference Scenario (i.e. if the Proposal did not proceed)					131,374	AVERAGE annual Scope 3 emissions for the Proposal Scenario (i.e. if the Proposal did proceed)				71,149

¹ For the purpose of the emissions calculations, it is assumed that GREs would be used to provide the incremental generation above the capacity of the existing diesel power stations in the Reference Scenario as this is considered best practice technology and an enabler for renewables. This allows comparison of the two scenarios and assumes:

- Power generation between scenarios are equal.
- The Reference Scenario contains existing diesel, with the difference to be made up with GREs.
- The Proposal Scenario includes GREs displacing all diesel.

* Each reported value is calculated using raw data and rounded. This means the totals will not exactly equal the sum of each year.