

DOCUMENT NO P-WGP2-059	REVISION Rev 1	DATE OF REVISION 20/04/2020
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mitsui E&P
Australia

Waitsia Gas Project Stage 2 - Greenhouse Gas Management Plan

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TERMS AND DEFINITIONS

Term or Abbreviation	Definition
AWE Perth Pty Limited	AWE Perth Pty Limited is the legal entity, operator of the relevant Production Licences (L1 and L2), the proponent for the Proposal and operates under the Mitsui E&P Australia (MEPAU) brand.
Climate change	A change in global or regional climate patterns, in particular a change apparent from the mid to late 20th century onwards and attributed, largely, to the increased levels of atmospheric Greenhouse gas.
DBNGP	Dampier to Bunbury Natural Gas Pipeline
EP Act	Environmental Protection Act 1986
GHG	Greenhouse gas
Greenhouse gas	<p>A greenhouse gas (GHG) is a gas that absorbs and emits radiant energy within the thermal infrared range. Greenhouse gases cause the greenhouse effect on planets.</p> <p>The greenhouse gases that are reported under the NGER Scheme include carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), sulphur hexafluoride (SF₆) and specified kinds of hydro fluorocarbons and perfluorocarbons.</p>
ha	hectare
km	kilometres
MEPAU	Mitsui E&P Australia
NGER	National Greenhouse and Energy Reporting From National Greenhouse and Energy Reporting Act 2007
Scope 1 emissions	Direct GHG emissions released to the atmosphere as a direct result of an activity, or series of activities at a facility level.
Scope 2 emissions	Indirect GHG emissions released to the atmosphere from the indirect consumption of an energy commodity.
Scope 3 emissions	Indirect GHG emissions other than scope 2 emissions that are generated in the wider economy. They occur as a consequence of the activities of a facility, but from sources not owned or controlled by that facility's business.
Terajoule	The terajoule (TJ) is equal to one trillion (10 ¹²) joules. The energy value of natural gas processed or combusted is typically reported in joules.
Trillion cubic feet	Trillion cubic feet (tcf) is a volume measurement of natural gas used by the oil and gas industry. This unit refers to the volume of gas at Standard Temperature and Pressure
WGP	Waitsia Gas Plant
XPF	Xyris Production Facility

1.0 SUMMARY

Table 1-1 summarises the context and purpose of the Greenhouse Gas (GHG) Management Plan (GHGMP) in the context of EPA environmental objectives.

Table 1-1 Summary of the Proposal and Key Provisions

Proposal title	Waitsia Gas Project Stage 2 (the Proposal) - EPA Assessment 2226
Proponent Name	AWE Perth Pty Ltd operating as MEPAU
Purpose of this GHG Management Plan	<ul style="list-style-type: none"> To support the assessment, approval and implementation of the Proposal under Part IV of the <i>Environmental Protection Act 1986</i> (EP Act). The Proposal (MEPAU, 2019d) is being assessed by the Environmental Protection Authority (EPA) under Part IV of the EP Act, through Assessment of Referral Information (ARI). This Greenhouse Gas Management Plan (GHGMP) has been developed in accordance with the <i>Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans</i> (EPA 2018a). This GHGMP has also been prepared to demonstrate the commitment of MEPAU to achieving the objective of the MEPAU Climate Change Policy (Appendix 3),
Ministerial Statement	Not issued at the time of preparation of the GHGMP.
Condition Clauses	No ministerial statement at the time of preparation of the GHGMP.
Key Environmental Factor/s and Objective/s	<p>Key environmental factor: Air Quality</p> <p>EPA Objective: <i>To maintain air quality and minimise emissions so that environmental values are protected. (EPA, 2016)</i></p> <p>Management plan objective: To mitigate GHG emissions having regard to the as low as reasonably practicable principle and to contribute to Western Australian GHG policy targets.</p>
Key Provisions in the GHGMP	<p>Management and reduction of contribution to state GHG concentrations from Scope 1 emissions through the implementation of the following key provisions:</p> <ul style="list-style-type: none"> Application of mitigation hierarchy and review and adoption of reasonable and practicable measures to mitigate Proposal scope 1 GHG emissions Establish Proposal baseline emissions and maintain emissions within the agreed baseline, to comply with the Commonwealth Safeguard Mechanism Implement GHG monitoring and reporting in accordance with the Commonwealth <i>National Greenhouse and Energy Reporting Act 2007</i> Preventative maintenance to minimise fugitive emissions of natural gas Preventative maintenance to ensure that emissions remain within the agreed baseline for the Proposal Adaptive management through three yearly review of reasonable and practicable measures to mitigate GHG emissions in response to developments in Commonwealth and State policies, markets, technology and regional infrastructure (Adaptive Management Review).

2.0 CONTEXT, SCOPE AND RATIONALE

This GHGMP¹ has been prepared by Mitsui E&P Australia Group (MEPAU)². This GHGMP is intended to support the assessment, approval and implementation of the Proposal under Part IV of the Environmental Protection Act 1986 (EP Act).

MEPAU referred the Proposal to the Environmental Protection Authority (EPA) under Part IV of the EP Act on 22 August 2019 (EPA Assessment 2226). The EPA have decided to assess the Proposal as a significant proposal, through Assessment of Referral Information (ARI). The ARI is to include additional information requested under Section 40(2)(a) of the EP Act, including this GHGMP, which will be subject to a two-week public review period.

MEPAU recognises that climate change represents a significant global challenge and is committed to being a part of the solution by providing safe, reliable and affordable energy whilst mitigating GHG emissions. The MEPAU Climate Change Policy (Appendix 3) outlines company commitments to Climate Change including:

- Working with governments and stakeholders in the design of climate change regulation and policies,
- Incorporating climate change risks into our decision-making and business operations,
- Identifying, evaluating and implementing, solutions to mitigate greenhouse gas emissions having regard to the as low as reasonably practicable principle and to fuel efficiency initiatives, in our existing operations and new projects, and
- Measuring and reporting greenhouse emissions as required by the regulation of the jurisdiction we operate in.

The GHGMP has been prepared with due consideration to:

- the MEPAU Climate Change Policy,
- the WA Government's GHG Emissions Policy for Major Projects (GoWA, 2019a),
- the EPA's GHG Environmental Factor Guideline (EPA, 2020), and
- the National Greenhouse and Energy Reporting Act, 2007 (NGER Act, 2007).

The GHGMP has applied the mitigation hierarchy (through the considered the adoption of design, technology and management measures) and proposes reasonable and practicable measures to mitigate GHG emissions. This includes an adaptive management framework to respond to current uncertainties and future developments in Government policies, markets and technology.

2.1 The Proposal

The petroleum exploration and production sector has been continually active in the Perth Basin since the 1960s. MEPAU is building on this long-standing presence and is progressively

¹ The GHGMP is structured in accordance with the Instructions on how to prepare *Environmental Protection Act 1986 Part IV Environmental Management Plans* (EPA 2018).

² AWE Perth Pty Limited is the legal entity, operator of the relevant Production Licences (L1 and L2), the proponent for the Proposal and operates under the Mitsui E&P Australia (MEPAU) brand.

developing the Waitsia gas field, a free-flowing³, conventional gas reservoir located ~16 kilometres (km) east-south-east of Dongara-Port Denison townsites in Western Australia (Appendix 1 and 2). The Waitsia Gas Project Stage 1 (Waitsia Stage 1) was commissioned in 2016 and has been producing from two existing wells through the Xyris Production Facility (XPF). The Waitsia Gas Project Stage 1 Expansion is now under construction and will connect an additional existing well to XPF and construct a pipeline connecting XPF to the nearby Dampier to Bunbury Natural Gas Pipeline (DBNGP).

The Proposal (known as the Waitsia Gas Project Stage 2 or WGP2) includes the construction and operation of the Waitsia Gas Plant (WGP), related wells and gas gathering infrastructure.

Table 2-1 provides a summary of the Proposal. Table 2-2 provides key project characteristics, with key project physical elements shown on Appendix 2.

Table 2-1 Summary of the Proposal

Proposal Title	Waitsia Gas Project Stage 2 (The Proposal)
Proponent Activities	Development of a conventional gas reservoir by designing and constructing wells, a gathering system, gas processing plant and export pipeline to the DBNGP
Short Description	<p>The Proposal includes the development of a gas plant, six new production wells, four hubs and a number of flowlines/pipelines. The Proposal includes the following components:</p> <ul style="list-style-type: none"> • Construction and operation of a new gas plant with a maximum export capacity of 250 terajoules (TJ) per day, • The operation of two existing wells, • The drilling, completion and connection of up to an additional six wells, • A gathering system comprising flowlines and hubs to convey the extracted gas to the WGP and the gas distribution network, and • Installing a flowline from the WGP to a water re-injection well to re-inject produced formation water into a disused petroleum formation.

³ No hydraulic fracture stimulation (i.e. no fracking) is proposed given the free-flowing nature of the Waitsia gas field.

Table 2-2 Key Project Characteristics

Physical Elements	Location	Proposed Extent
Development Envelope	Refer Appendix 2	The total area of the development envelope for the Proposal area is ~345 ha.
Gas Processing Plant		The WGP site is ~156 ha and is located on a completely cleared paddock. No clearing of vegetation is required.
Well sites		Well sites vary between 1.5 ha and 3.95 ha. Total area for wells is ~25 ha. No well pad sites require clearing of native vegetation.
Hubs		Hubs vary between 0.45 ha and 2.7 ha. The total area for hubs is ~11 ha. No hub sites require clearing of native vegetation.
Flowlines/pipelines		The total area within the flowline easements is ~153 ha. Within this total easement area, the maximum area of native vegetation to be cleared is ~17 ha.
Operational Elements	Details	
Disposal of produced formation water	Re-injection of ~1 million m ³ of Produced Formation Water over the expected 20-year life of the Proposal, thus minimising the requirement for and size of evaporation ponds.	
Air emissions	Air emissions from the WGP.	
Noise emissions	Noise emissions from the WGP.	
GHG Emissions	Total Scope 1 emissions are ~300,000 tCO ₂ e per annum, assuming an average reservoir CO ₂ concentration of 6.0 mol%. The Proposal does not include the import or export of electricity, and as such does not have Scope 2 emissions.	

2.1.1 Waitsia Gas Plant

Gas extracted from the wells will be conveyed to centrally located gas gathering stations, or hubs, then directed via flowlines to the proposed Waitsia Gas Plant (WGP or the ‘Plant’) for processing prior to export to the nearby DBNGP.

The WGP will use similar components as those used for processing Waitsia Stage 1 gas from the existing XPF. The WGP comprises the following processing components, which are required to condition the gas to meet the DBNGP pipeline gas quality specifications:

- Slug catcher and inlet separation as the gas enters the WGP,
- Mercury removal equipment,
- Gas refining to remove carbon dioxide (also known as ‘sweetening’),

- Waste gas incineration,
- Hydrocarbon dew-point control,
- Water content control,
- Export compression,
- Sales gas metering,
- Condensate export system,
- Produced water treatment, and
- Support utilities.

The WGP will be operated 24 hours a day throughout the year, except for maintenance shutdowns.

2.1.2 Wells

Currently, two separate existing wells (i.e. Waitsia-01 and Senecio-03) are operating as Waitsia Stage 1, with gas extracted from these wells transmitted to the existing XPF. The Waitsia Stage 1 Expansion will connect a third existing well (i.e. Waitsia-02) to XPF.

The Proposal will connect two other existing wells (i.e. Waitsia-03 and Waitsia-04) to the proposed Waitsia Gas Plant, with drilling and connection of up to six additional wells⁴.

2.1.3 Supporting Utilities

The following supporting utilities will be required for the Proposal:

- Fuel gas system,
- Electrical power generation facilities,
- Heating medium system,
- An instrument air system,
- Flare system,
- Fire water system,
- Utility water system, and
- Diesel system.

2.1.4 Greenhouse Gas Emissions Inventory

A GHG emissions assessment was developed and accounts for all upstream (reservoir) and processing (WGP) emissions⁵. The assessment includes consideration of all GHGs listed under

⁴ A further stage of Waitsia gas field development could include connecting the existing three (3) Stage 1 wells to the WGP and / or drilling and connection of an additional eight (8) wells resulting in an expected 19 wells in total over the life of the Waitsia gas field. However, any additional wells connecting to WGP would be separate to this Proposal and subject to separate approvals.

⁵ The Proposal only includes Scope 1 emissions. As the WGP will generate all required electricity on site there are no Scope 2 indirect emissions associated with consuming an energy commodity.

the NGER Act 2007, with total emission represented as tonnes carbon dioxide equivalent (tCO₂-e).

Total Scope 1 emissions are estimated to be ~300,000 tCO₂-e per year (tCO₂-e/yr), assuming an average reservoir carbon dioxide (CO₂) concentration of 6.0 mol%⁶, an exported gas production rate of 250 TJ/day and operation 365 days per year. Total Scope 1 emissions includes ~180,000 tCO₂-e/yr related to reservoir CO₂ removal and ~ 120,000 tCO₂-e/year from the WGP operations (refer to Table 2-3).

The Proposal will export an estimated 250 TJ of gas per day. Therefore, the Proposal will have an estimated GHG intensity of 3.29 tCO₂-e/TJ including reservoir CO₂. The GHG intensity when considering gas processing emissions only is estimated to be 1.32 tCO₂-e/TJ (of the total 3.29 tCO₂-e/TJ).

Annual GHG emissions related to the reservoir sourced CO₂ that must be removed as part of processing will vary depending on the CO₂ mol% of the Waitsia gas reserve (CO₂ reservoir content ranges from 4.5 mol% in the north of the reservoir to 7.5 mol% in the south with an expected average of 6.0 mol%).

The Proposal is estimated to have lower emissions relating to export gas compression due to the minimal transmission distance (~5 km) and lower entry pressure to the DBNGP.

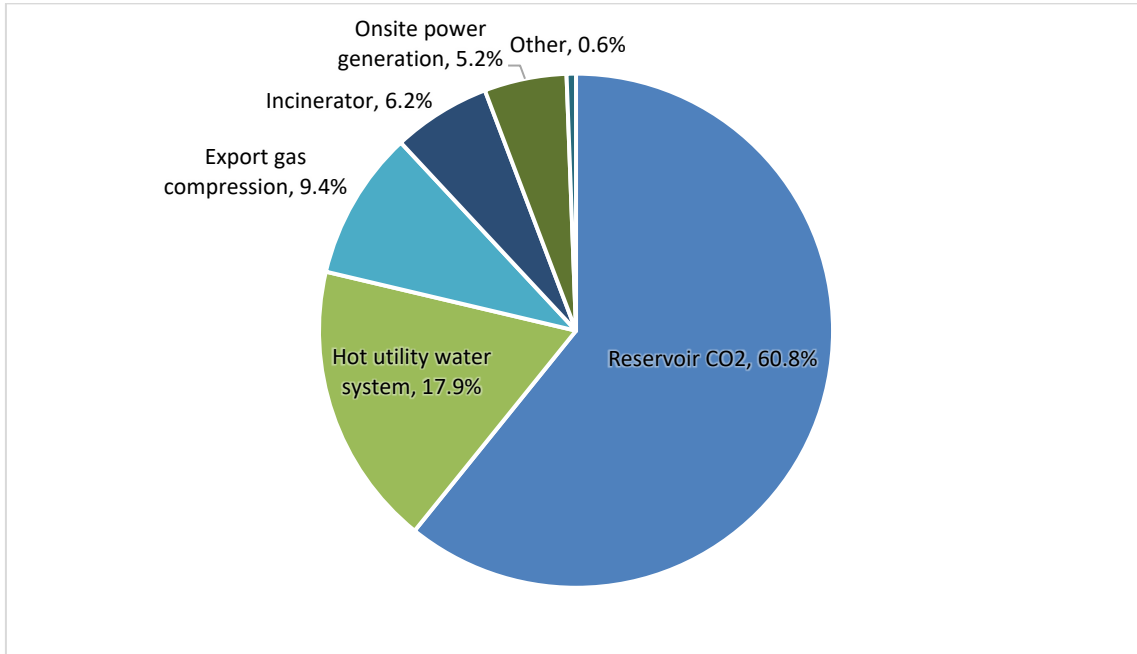
Table 2-3 Approximate Annual Greenhouse Gas Emissions from Processing Plant

Gas Processing Plant GHG Source	Estimated annual GHG Emissions (tCO₂-e/yr)
Hot utility water system	53,000
Export Gas Compression	27,800
Incinerator	18,300
Onsite Power Generation	15,400
Flare - Purge	440
Flare - Relief / Blowdown	330
Demineralised Water Tank (blanket)	260
Condensate Loading Package	210
Produced Water Evaporation Pond	180
Condensate Storage Tanks (blanket)	120
Flare - Pilot	60
Design margin	3,900
Total	~ 120,000

⁶ Based on a reservoir range of 4.5 mol% in the north to 7.5 mol% in the south

Figure 2-1 presents GHG emissions by source, of which ~99% of emissions relate to five main sources.

Figure 2-1 Breakdown of greenhouse gas emission sources



2.2 Key Environmental Factors

In assessing the referral, the EPA has identified preliminary key environmental factors as Air Quality, Flora and Vegetation, Inland Waters, and Social Surroundings. The GHGMP addresses the Air Quality key environmental factor. The management provisions for other preliminary key environmental factors are addressed by separate environmental management plans. Table 2-4 provides a summary of the Air Quality environmental factor with respect to GHG emissions.

Table 2-4 Summary of preliminary key environmental factor: Air Quality

Air Quality	
EPA objective	To maintain air quality and minimise emissions so that environmental values are protected.
Policy and guidance	<ul style="list-style-type: none"> • <i>Environmental Factor Guideline Air Quality (EPA 2016) Measure (NEPC, 2016).</i> • <i>National Environment Protection (Ambient Air Quality) Measure 1998</i> • <i>Greenhouse Gas Emissions for Major Projects (GoWA, 2019a)</i> • <i>Climate Change in Western Australia – Issues Paper (DWER, 2019)</i> • <i>Environmental Factor Guideline : Greenhouse Gas Emissions (EPA, 2020)</i>
Project activities	<ul style="list-style-type: none"> • Conventional gas extraction • Processing of natural gas • Export of compressed natural gas to the DBNGP
Potential impacts	<ul style="list-style-type: none"> • Scope 1 Emissions- Average annual GHG emissions of ~300,000⁷ tonnes tCO₂-e • Scope 2 Emissions - There are no Scope 2 emissions, as no electricity is imported or exported. • Scope 3 Emissions- There are no Scope 3 emissions presently addressed in the GHGMP – refer to EPA's Environmental Factor Guideline: Air Quality (EPA, 2016) and <i>Environmental Factor Guideline: Greenhouse Gas Emissions (EPA, 2020).</i>

2.3 Conditional Requirements

The Proposal is currently being assessed by the EPA, therefore a Ministerial Statement and associated conditions are yet to be issued.

Should the Proposal be approved for implementation, the conditions relating to GHG management will be included in this section.

2.4 Rationale and Approach

A number of key information sources and aspects inform the rationale and approach of the management provisions outlined in Section 3.0. This section provides a concise description of the rationale and approach for the GHGMP. Specially, the following sub-sections summarise:

- Study findings (Section 2.4.1)
- Benchmarking assessment – Reservoir (Section 2.4.2)
- Benchmarking assessment – Process (Section 2.4.3)
- Key assumptions and uncertainties (Section 2.4.4)
- Management Approach (Section 2.4.5)

- Rationale for Choice of Provisions (Section 2.4.6)

2.4.1 Study Findings

A number of studies were undertaken or reviewed to assess the feasibility and practicability of various design components and aspects of the Proposal. Table 2-5 provides a summary of these studies.

Table 2-5 Recent Study Findings

Study	Description of findings
<p>A Comparison of Physical Solvents for Acid Gas Removal (Burr and Lyddon 2008)⁸</p>	<p>This study describes and compares the technology options for acid gas removal (e.g. hydrogen sulphide or CO₂) from natural gas streams. The more commonly used treatment technologies are summarised as follows:</p> <ul style="list-style-type: none"> • Chemical solvent processes which rely on chemical reactions to remove acid gas constituents from gas streams and include compounds such as ethanalamines (often abbreviated to “amines”) and hot potassium carbonate. Heat is required to regenerate chemical solvents. Commonly used throughout the industry. • Physical solvents rely on the physical interaction between CO₂ and other gases. Pressure reduction and a lower degree of heat is required to regenerate the physical solvent, however solvent circulation rates are magnitudes greater than compared to chemical solvents. • The membrane process is most applicable for higher acid gas concentration gas streams. Waste streams (permeate) require significant recompression (power) and secondary treatment to reduce overall hydrocarbon losses and improve efficiencies. • Cryogenic fractionation has the advantage that the removed CO₂ can be obtained at relatively high pressure, which is advantageous for secondary CO₂ uses. However, this advantage is offset by significant refrigeration (power) requirements and specialised (cold service) materials. <p><i>This study indicates that for the adopted design measures, the amine system is most appropriate as it is it maximises CO₂ removal for this particular reservoir. Therefore, the amine process was adopted..</i></p>
<p>WGP Plant Efficiency WGP2-KDL-041 (MEPAU, 2019a)</p>	<p>This internal decision record outlines the two processing technology options for carbon dioxide removal in the gas plant facility: amine absorption and membranes. Based on the overall processing plant configurations and overall system efficiencies (influencing overall emissions) MEPAU (2019a) determined that the amine absorption technology has a better process efficiency (in removing CO₂) but has a</p>

⁸ A more recent study, Pouladi et al, 2016 supports the study by Burr and Lyddon, 2008. Further, Pouladi et al, 2016 states that the amine process exhibits high reaction rate and high capacity of removal even at low concentration of CO₂ as an advantage over physical solvents.

Study	Description of findings
	<p>higher operational cost than the membrane technology over the life of the project.</p>
<p>Investigation of renewable energy options (MEPAU, 2020)</p>	<p>An analysis of on-site electrical power generation options and grid supply / export of power for the Proposal was completed.</p> <p>The analysis included assessment of small-scale options for renewable energy supply to offices and buildings. It was determined that renewable energy options (geothermal, wind and solar systems) did not offer a commercial payback period or practical supply for offices and buildings.</p> <p>The analysis considered large-scale renewable energy systems (solar, wind and battery systems, in combination with either grid connection or on-site generation) to power the WGP equipment.</p> <p>It was concluded that grid connected options were not feasible due to technical and operational risk of connecting to the South West Interconnected System (SWIS). Connection with the SWIS would require twin feeders from 80 km away at Eneabba, which represents a single point of power failure for power supply to the WGP. Furthermore, it was concluded that it was economically unfeasible due to the high capital costs of high voltage transmission infrastructure required to connect to the SWIS.</p> <p>It was determined that the lowest net present cost (NPC) (excluding the cost of gas) is onsite (i.e. off-grid) electrical power generation using gas fired reciprocating engines and alternators. This option takes advantage of the available gas source from the WGP.</p> <p>As a sensitivity, the NPC was calculated assuming a gas price of \$4/GJ (matching the current market) and a production rate of 250 TJ/d to compare the lowest NPC option to three renewable options. On this basis, all four options have very similar NPC; within 1%; after 20 years of operation. (MEPAU, 2020). However the project only has gas reserves to support approximately seven (7) years of production at 250 TJ/d, in the most-likely reservoir outcome, requiring a gas price substantially higher than the mid to long term market price in WA to be attractive.</p> <p><i>Renewable options will be revisited as technology evolves, costs reduce and the Waitsia field matures (in line with MA1, detailed in Table 3-1)</i></p>
<p>Grid Connection WGP2-KDL-042 (MEPAU 2019b)</p>	<p>This internal decision record provides a summary of the practicability and economic feasibility of connecting the Proposal to the SWIS utility grid, based on stakeholder engagement completed with Western Power. This would eliminate the need for onsite power generation and would provide sufficient power for all Plant equipment.</p> <p>MEPAU (2019b) assessed that the risk to project reliability and schedule is unacceptably high for the Proposal since the utility provision is largely out of MEPAU's project control and that the supply line represents a critical single point of power generation failure.</p>

Study	Description of findings
	MEPAU (2019b) also concluded that based on the information available about the existing power grid, tariff structure and high-level budgetary estimates, utilising utility power for the Stage 2 development is not economic or practicable. Therefore, MEPAU did not pursue this option.
Use of renewables for WGP2 WGP2-KDL-051 (MEPAU 2019c)	<p>This internal decision record evaluated the use of renewables for the Proposal MEPAU (2019d). The evaluation showed, when compared to gas fired electrical power generation, renewables resulted in a negative commercial outcome. In addition, renewable technology is currently not sufficiently developed to be totally relied upon to provide base load power requirements (Needham, 2008; Platt, 2018). Therefore, concurrent investment in gas fired electrical power generation is required to provide power generation when renewables cannot operate. This requirement further adds to the negative commercial outcome.</p> <p>MEPAU (2019d) determined that while it is uneconomic to install renewable energy even on a small scale, a solar power system will be installed to provide power to the Administration and Control Building (MEPAU 2019c). In conjunction, a heat pump system will be installed to support the climate control system for the Administration and Control Building (MEPAU 2019c).</p> <p>Solar panels and batteries will be utilised at remote well sites for control systems, safety systems, communications and localised lighting demands (MEPAU 2019c).</p>
Natural Gas Reservoir Benchmarking assessment (GHD 2020)	<p>GHD (2020) completed a benchmarking assessment of reservoir CO₂ concentration and reservoir size of the Waitsia gas field against other gas fields using publicly available data and information. The benchmarking exercise shows that in comparison to Australian reservoirs currently being extracted from, the Waitsia Gas Field has a reservoir CO₂ concentration representative of the national and Western Australian average. The Waitsia reservoir is smaller in reserve volume (with consequential reduced CO₂ emissions) in comparison to other gas fields.</p> <p>The results of the desktop assessment are presented in Section 2.4.2.</p>

2.4.2 Benchmarking Assessment – Reservoir

GHD (2020) completed a benchmarking desktop assessment of natural gas reservoirs in Australia to compare reservoir CO₂ content and reservoir size. The benchmarking assessment by GHD did not include a comparison of processing plant emissions intensity as this information is not publicly available. Comparison of the processing plant was not completed as there are differences in equipment between domestic and export liquid natural gas (LNG) which does not allow a like-for-like comparison.

The benchmarking assessment selected a number of natural gas reservoirs within Australia that are currently being developed. The selection of natural gas reservoirs for comparison with the Proposal was based on:

- Location – Only reservoirs in Australia were selected to represent comparable operating conditions (including climatic conditions) and facility designs.

- Available data – the data used has been solely obtained from publicly available environmental impact assessments (EIA), or similar. This is acknowledged to be a short-coming as the data is representative of expected emissions over a specified project lifecycle.

The results of the benchmarking assessment are shown in Table 2-6, and shown graphically in Figure 2-2 and Figure 2-3. The average reservoir CO₂ content indicates the GHG intensity of developing the gas, whereas reservoir CO₂ content and size of reservoir indicates the magnitude of CO₂ emissions.

The benchmarking exercise shows that in comparison to Australian reservoirs currently being extracted from, the Waitsia Gas Field has a reservoir CO₂ concentration representative of the national and Western Australian average. Note that all three Queensland reservoirs included in the benchmarking assessment are coal seam gas projects, which although the reservoir CO₂ content is lower, require significantly more energy to treat the gas to meet export gas requirements due to the fact that they require compression from very low pressure to reach the required inlet pressure at the LNG facility.

When comparing total reservoir size, the Waitsia Gas field is shown to be significantly smaller than the National and Western Australian average. By comparing CO₂ mol% and reservoir size, the magnitude of reservoir CO₂ potentially emitted to the atmosphere can be visualised.

Table 2-6 Benchmarking of reservoir CO₂ (GHD, 2020)

Reservoir	State / Territory	Average CO ₂ reservoir content (mol%)	Size of reservoir (tcf ¹)
Waitsia Gas Field ²	WA	4.5-7.5	0.74
Shell -Prelude Gas Field	WA	9	3
Inpex - Ichthys – Brewster Reservoir	WA	8.5	7
Inpex - Ichthys – Plover Reservoir	WA	17	5.8
Chevron - Gorgon – Gorgon Reservoir	WA	14	16
Chevron - Gorgon- Janz Reservoir	WA	0.5	20
Santos – Reindeer Gas Field	WA	3.5	0.4
BHP – Macedon	WA	0.38	0.7
Santos – John Brookes	WA	5.8	1
ConocoPhillips – Barossa – Caldita (average)	NT	16-20	3.5
Santos - Gladstone LNG (Surat and Bowen Basin)	QLD	0.3	4
APLNG (average)	QLD	1	6.6
QGC- QLNG (average)	QLD	0.5	1.2

¹ tcf represents trillion cubic feet

² The Waitsia gas field reservoir size represents the 50% probability value.

Figure 2-2 Australian Natural Gas Reservoir CO₂ Content

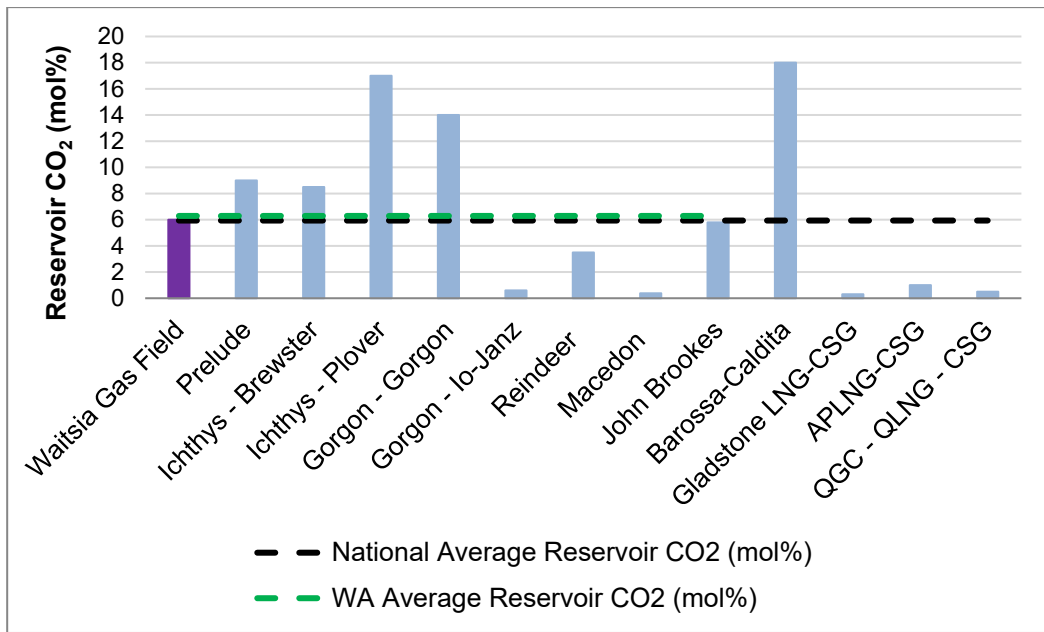
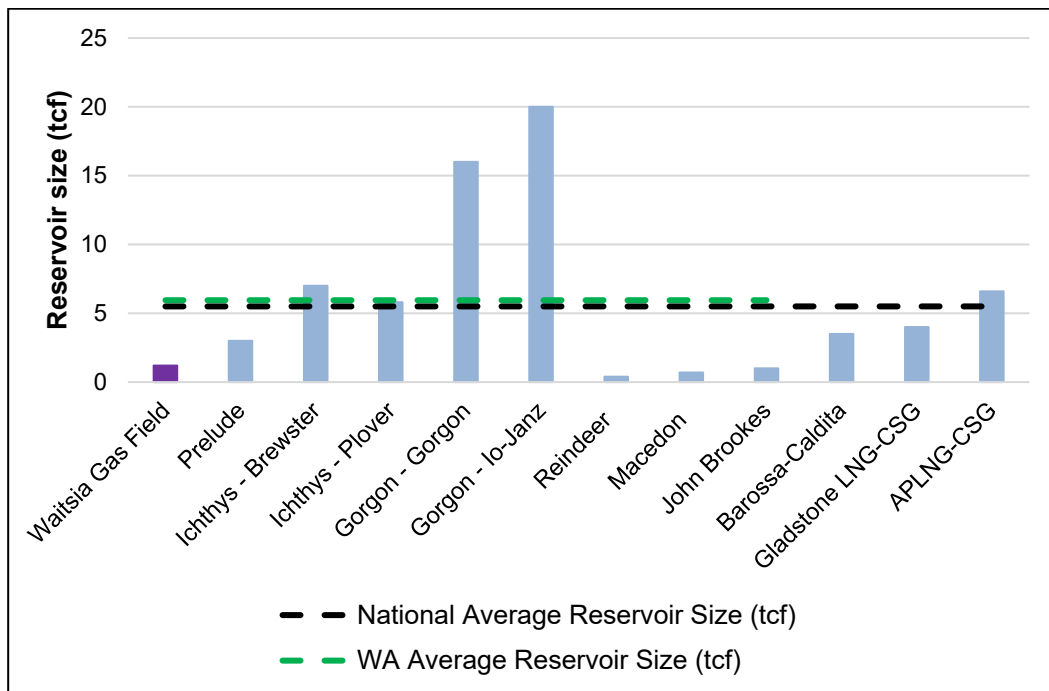


Figure 2-3 Australian Natural Gas Reservoir Size



While the pipeline distance required to transport processed gas to the export point has not been included in the above benchmarking assessment, the Proposal is located ~5 km from the export point, the DBNGP. The pipeline distance influences the compression requirements of the exported gas, thus the Proposal GHG emission intensities associated within the gas processing plant total emissions will be lower compared to reservoirs with longer export distances.

2.4.3 Benchmarking Assessment – Process

Due to the size of the WGP, and as there has been a limited number of similar sized Gas Plants assessed by the EPA under Part IV of the EP Act , it is difficult to benchmark WGP against similar facilities. However, based upon the size of the facility, there are similarities with the BHP Billiton Petroleum Pty Ltd Macedon Gas Development in the Pilbara (approved by the EPA in 2010 (Ministerial Statement 844) and commenced production in September 2013).

Macedon Gas Project

The average annual GHG emission over the operating life of the Macedon gas plant⁹ was estimated at 115,000 tonnes of CO₂-e (EPA, 2010). This represents the construction of only one gas “train” with an output of 100 TJ/day and where the use of compression is limited.

In comparison, as detailed in Section 2.1.4, the Waitsia Gas Plant, at an exported gas production rate of 250 TJ/day, has a total scope 1 emissions of ~ 120,000 tCO₂-e/year from the WGP operations and ~180,000 tCO₂-e/yr related to reservoir CO₂ removal.

2.4.4 Key Assumptions and Uncertainties

Table 2-7 details the key assumptions and uncertainties that MEPAU have made with respect to the proposed approach to managing GHG emissions.

Table 2-7 Assumptions and Uncertainties in Greenhouse Gas Management

No.	Assumptions and Uncertainties
1	<p>State of WA and Commonwealth GHG policy</p> <p>The Western Australian EPA released a draft GHG Factor Guideline in December 2019. The guideline was finalised in April 2020 (EPA, 2020).</p> <p>State and Commonwealth Government policies continue to evolve. Key uncertainties remain. They include:</p> <ul style="list-style-type: none"> • The finalisation of the Commonwealth "Benchmark Baseline" concept for new industry projects, which will enable proponents to apply for a 'baseline' of GHG emissions (tCO₂e). • the State's contribution to Commonwealth targets versus other states • the setting of Interim Targets to 2050 • the setting of sector specific targets for industry versus other sectors (e.g. power, transport, agriculture, buildings). <p>The State of Western Australia is proposing to release a State Climate Policy and Energy Transformation Policy in 2020, the details of which (including targets) are unknown.</p> <p>MEPAU has proposed management provisions that have been developed with consideration of the current state of GHG policy in Australia. An adaptive management approach has been proposed that aligns with anticipated milestones in State and Commonwealth GHG policy evolution.</p>

⁹ In its assessment of the Macedon project, the EPA (EPA, 2010) noted that the raw produced gas contained only trace amounts of carbon dioxide which would not be removed by the process. The gas would be supplied into the DBNGP to supply the domestic market. It is therefore assumed that CO₂ emissions are more than 95% associated with the Macedon gas plant operations.

No.	Assumptions and Uncertainties
2	<p>Market price carbon emissions</p> <p>As of April 2020, there is no uniformly applied (i.e. on unit of carbon emitted) market price for carbon emissions (i.e. a carbon levy) within Australia. This may change in the future, given that there was a formal national price for carbon emissions (also known as a 'carbon tax') in the past, formerly repealed in 2014 (DotEE 2014).</p> <p>MEPAU will assess opportunities for future project investments to reduce net State and Commonwealth CO₂ emissions in line with its adaptive management approach (as detailed in Section 5.0)..</p>
3	<p>Cost of technology for renewable energy</p> <p>MEPAU, 2020 concluded that the market price for renewable energy technology in Western Australia is cost prohibitive when considering the scale of equipment, reliability and capacity necessary to power the WGP.</p> <p>MEPAU has stated that the current basis of design takes into consideration the capital investment required, as well as other considerations such as efficiency. The cost of renewables has changed significantly over the last 10 years, and further downward trends are expected. It is possible that installation of renewable technology will become a viable option in the future, and this will be assessed in line with MEPAU's adaptive management approach (as detailed in Section 5.0).</p>
4	<p>Availability of electrical power transmission infrastructure</p> <p>As part of the design process, MEPAU consulted with Western Power. Western Power indicated they do not intend to develop the required infrastructure in the Dongara-Port Denison area during the next five years.</p> <p>As of January 2020, the availability of electrical power transmission in the region of the Proposal is limited and the nearest connection point is over 80 km away. MEPAU has assessed that connection to a reliable electrical grid represents an unacceptable risk to the project during construction and operation, particularly as this option presents a clear "single point of failure". Further, it would require substantial capital investment beyond the economics of the project.</p> <p>There is the potential that this may change within the project lifetime and this will be reviewed as part of MEPAU's adaptive management approach (as detailed in Section 5.0).</p>
5	<p>Options and viability of processing technology</p> <p>Each gas reservoir has unique characteristics and the selection of the most appropriate processing technology relies upon a multitude of factors, often specific to the reservoir. MEPAU engaged a consultant to study the commercially available technologies for gas processing and assess their suitability to the Waitsia reservoir at a screening level. The study concluded that several different combinations of processing technology were suitable and comparable. Further, it concluded that the final technological solution would need to holistically consider and balance all aspects. Examples of areas of technological solutions include plant efficiency (which affects CO₂-equivalent emissions), fuel consumption, air and water emissions, footprint, visual amenity, constructability, operability, plant capacity and plant life.</p> <p>Using the results of the study, MEPAU conducted a design competition to encourage the optimisation of efficiency and selection of appropriate (i.e. suitability with the resource) overall plant technologies, including emission</p>

No.	Assumptions and Uncertainties
	<p>mitigation measures, for the scale and regional location of the plant. The design competition completed by MEPAU selected a combination of amine for gas sweetening and a low temperature separator for hydrocarbon and water dewpoint requirements. Whilst it is unlikely that a more energy efficient technology will become a viable option over the life of the reservoir, new technology will be assessed in line with MEPAU’s adaptive management approach.</p>
6	<p>Reservoir CO₂ concentration</p> <p>The GHG emission estimates are variable depending on the CO₂ proportion within the gas reservoir. CO₂ reservoir content ranges from 4.5 mol% in the north of the reservoir to 7.5 mol% in the south with an expected average of 6.0 mol%.</p> <p>The average reservoir CO₂ concentration of 6.0 mol% used to estimate GHG emissions represents a reasonable assumption based on the distribution of gas and CO₂ concentrations in the reservoir, however it is possible for the actual GHG emissions to vary within the range of 4.5 to 7.5 mol%. For example, should natural gas extracted in the first project years contain lower or higher levels of CO₂, then the total annual GHG emissions will decrease or increase accordingly.</p> <p>MEPAU will monitor reservoir CO₂ emissions and assess abatement opportunities in accordance with their adaptive management approach.</p>
7	<p>Processing Plant CO₂ Emissions</p> <p>The GHG emission estimates for the processing plant are primarily dependent on the reservoir CO₂ concentration. However, there is a minimum baseload of CO₂ emissions due to the fact that individual equipment have certain minimum operating requirements. The calculation of these emissions is based on best available data generated by the plant designer and represents industry best practice design margins as to the performance of the plant across the range of operational conditions and production levels.</p> <p>MEPAU will monitor CO₂ emissions from the whole of plant and individual equipment to assess abatement opportunities in accordance with their adaptive management approach.</p>

2.4.5 Management Approach

MEPAU will implement management-based provisions for this Plan. The management approach is based on the following objectives:

- Alignment with the State Government’s commitment to working with the Commonwealth Government’s target of reducing greenhouse gas emissions by 26 to 28% by 2030,
- Alignment with the State Government’s *Greenhouse Gas Emissions Policy for Major Projects* to contribute towards the State’s aspiration of net zero emissions by 2050,
- Alignment with EPA Guidance (EPA, 2020), through applying the mitigation hierarchy (i.e. considering reasonable and practicable measures to mitigate GHG emissions),
- Adopting design, technology and management measures to mitigate GHG emissions, having regard to the as low as reasonably practicable principle,
- Commitment in supporting the State Government in developing technical guidance to support greenhouse gas emission reduction within the gas industry,

- Compliance with relevant State and Commonwealth GHG emission monitoring and reporting requirements, including NGER and the Safeguard Mechanism, and
- Adaptive management to respond to current uncertainties and future developments in Government policies, markets and technology.

2.4.6 Rationale for Choice of Provisions

In line with the mitigation hierarchy detailed in EPA, 2020, MEPAU has proposed the management provisions outlined in Section 3.0 based on the following rationale:

- GHG abatement opportunities adopted in this GHGMP have been assessed by MEPAU to determine whether they are reasonable and practicable against multiple criteria including safety, technical performance, operability, emissions reduction, availability, scale, and economic return. MEPAU considers that reasonable and practicable GHG abatement measures are considered 'good industry practice'.
- There is potential for substantial changes in GHG policies, markets and technology as well as regional energy infrastructure over the Proposal lifetime, which may influence the reasonableness or practicability of GHG abatement measures. In this GHGMP, MEPAU will complete periodic reviews of policies, markets, technology and infrastructure as part of their adaptive management approach.
- MEPAU have proposed a major refit milestone for the Proposal during its lifetime, which offers a potential opportunity to implement further GHG abatement measures if these become practicable due to policy, market, technological or infrastructure changes. The milestone has been set at a practicable frequency to enable sufficient time to plan, design and procure and implement abatement opportunities ahead of the major refit milestone.
- MEPAU will monitor GHG emissions to:
 - report in accordance with legislative requirements, and
 - measure achievements in reductions of adopted technologies.
- MEPAU will establish a baseline or outcome-based provision representative of the potential risk due to the natural variability of CO₂ within the Waitsia Gas Field, which will influence the intensity of GHG emissions of production from year to year.

3.0 GREENHOUSE GAS MANAGEMENT PROVISIONS

3.1.1 Management provisions

This section presents the management provisions proposed by MEPAU to fulfil the objective of the Air Quality (greenhouse gas emissions) key environmental factor and the objectives of this GHGMP.

This section has been prepared having regard to the *Greenhouse Gas Management Plan section of the Environmental Factor Guideline: Greenhouse Gas Emissions* (EPA, 2020).

MEPAU will implement management provisions, detailed in Table 3-1, consistent with the rationale and approach presented in Section 2.4.

Table 3-1 Greenhouse Gas emission management provisions (Management-based)

EPA Objective: To maintain air quality and minimise emissions so that environmental values are protected (EPA, 2016)			
GHGMP Objective: To mitigate GHG emissions having regard to the as low as reasonably practicable principle and to contribute to Western Australian GHG policy targets.			
Key impacts and risks: Contribution to the State GHG emissions and contribution to climate change			
Management action or Environmental criteria	Management target / Response Action	Monitoring (method, location and timing)	Reporting
MA1 Application of the mitigation hierarchy and review and adoption of reasonable and practicable measures to mitigate Proposal scope 1 GHG emissions	Review of GHG emissions abatement opportunities (see Section 4.1, Table 4-1) with consideration to outcomes to support MA8.	Annually	Annual internal reporting
MA2 Establish Proposal baseline emissions and maintain emissions within the baseline, to comply with the Commonwealth Safeguard Mechanism	Establish a baseline for the Proposal and submit this to the Commonwealth Clean Energy Regulator Maintain emissions below the established baseline and report as required	12 Months Annually	Compliance with established baseline included in Annual Environmental Reporting and published as part of annual Safeguard Mechanism data tables by the Clean Energy Regulator. Annual reporting in accordance with the <i>NGER Act 2007</i> . Annual internal reporting
MA3 Implement GHG monitoring and reporting in accordance with the Commonwealth <i>National Greenhouse and Energy Reporting Act 2007</i>	Monitor and report on all Scope 1 GHG emissions	Annually	Annual reporting in accordance with the <i>NGER Act 2007</i> Annual internal reporting
MA4 Establish and achieve Interim Emissions Targets	Implement initiatives to achieve the Interim Target to reduce baseline CO ₂ emissions from the maximum production baseline, reduced to the average production levels for the period of production, by either avoiding, reducing or offsetting CO ₂ emissions by: 1. 10% by 2025, and 2. 26% by 2030.	12 Months 5 yearly	Annual Compliance Assessment Report to the EPA detailing efforts made to achieve the Interim Target. Publicly reporting against Interim Targets (GoWA, 2019 and EPA, 2020)
MA5 Establish Aspirational Long-term Targets	MEPAU will implement a program of rolling five-year review of national and international developments (Long-term Target Review tied to the Target reporting periods) to define informed aspirational targets approximately ten years in advance that align with the State's goal of zero net emissions by 2050. Accordingly, set Aspirational Long-term targets for 2035 in 2025.	5 yearly	Publicly report defining Aspirational Long-term Targets, in line with public report against Interim Targets.
MA6 Preventative maintenance to minimise fugitive emissions of natural gas	Establish a leak detection and repair (LDAR) programme that will identify issues Establish a maintenance program to minimise emissions from pressure relief valves Establish a target for number of pressure relief instances and quantity of leaked emissions	12 Months 12 Months 12 Months	Annual Compliance Assessment Report to the EPA detailing pressure relief instances and quantity emitted.

EPA Objective: To maintain air quality and minimise emissions so that environmental values are protected (EPA, 2016)			
GHGMP Objective: To mitigate GHG emissions having regard to the as low as reasonably practicable principle and to contribute to Western Australian GHG policy targets.			
Key impacts and risks: Contribution to the State GHG emissions and contribution to climate change			
Management action or Environmental criteria	Management target / Response Action	Monitoring (method, location and timing)	Reporting
	Monitoring and reporting of fugitive emissions data	Annually	
MA7 Preventative maintenance to ensure that emissions remain within the agreed baseline for the Proposal	Establish a comprehensive monitoring program to facilitate assessment of plant efficiency and operating conditions Develop procedures to address plant non-conformances	12 Months 12 Months	Preparation of a quarterly plant performance report, presented internally.
MA8 Adaptive management through three yearly review of reasonable and practicable measures to mitigate GHG emissions in response to developments in Commonwealth and State policies, markets, technology and regional infrastructure	Triennial reviews undertaken. GHGMP updated with triennial review findings.	Triennial review and assessment of practicable emission reduction opportunities	Preparation of an abatement opportunities assessment report presented internally. New abatement opportunities will be adopted where practicable and documented in this management plan.

4.0 MANAGEMENT ACTIONS

Sections 4.1 to 4.5 provide further detail to support Management Actions detailed in Table 3-1

4.1 MA 1 - Greenhouse gas emission abatement opportunities

As part of the development of the EPA referral (EPA Assessment 2226), MEPAU conducted an extensive review of reasonable and practicable GHG emission abatement opportunities. As outlined in Table 2-3, those opportunities have been adopted into the final design of the WGP and have resulted in the lowest possible levels of GHG emissions.

Table 4-1 provides a summary of the adopted GHG emission abatement opportunities/measures, which are reasonable and practicable and considered to be best or leading industry practice.

A review of reasonable and practicable GHG emission abatement opportunities will be conducted on an annual basis as detailed in Table 3-1 (MA 1).

Table 4-1 Greenhouse Gas abatement opportunities adopted during WGP Design Competition

Greenhouse Gas abatement opportunity adopted	Mitigation Hierarchy	Justification
<p>Direct fired gas boiler Using a direct fired gas boiler (Hot Water system) to convert 85% of chemical energy (thermal efficiency) into a temperature change</p>	Reduce	Using a direct fired gas boiler converts 85% of chemical energy (thermal efficiency) into a temperature change. An alternative would be the use of an electric heating element, powered from the plant through power generation system. The efficiency of conversion of gas to electricity and then electricity to heat is in the order of 35%.
<p>Gas engines for compression Export gas compression using gas engines with a reciprocating compressor</p>	Reduce	Use of gas engines over the alternative of gas turbines provides a configuration that is the most efficient, as it most closely matches the expected operating points, enables flexibility over operating conditions and processing load.
<p>Gas engines for onsite electrical power generation</p>	Reduce	Gas engines have a higher thermal efficiency compared to gas turbines. Gas engines have been selected as these are able to better adapt to changing power demands, thereby optimising energy production.
<p>Chemical (amine) solvent for CO₂ removal Amine system for reservoir CO₂ removal</p>	Reduce	Either physical or chemical solvents are used to remove CO ₂ in the Australian Oil and Gas Industry, however the amine (chemical solvent) system offers better outcomes for this reservoir.
<p>Battery Energy Storage System Use of a Battery Energy Storage System (BESS) to operate as a standby spinning reserve</p>	Avoid	Installation of a BESS to provide spinning reserve is not typical in the Australian oil and gas industry. The BESS avoids the need to have a gas engine-generator running as spinning reserve. This is leading industry practice.
<p>Gas recirculation Recirculation of hydrocarbons present within the processing plant via a Plant Recycle Line. Upon plant startup, off-specification gas is recirculated back to the process start and retreated, until gas specifications are achieved, and gas export can commence.</p>	Avoid	Upon plant start-up, off-specification gas is recirculated back to the process start and re-treated, until gas specifications are achieved, and gas export can commence. This avoids the need to flare the off-specification gas.

Greenhouse Gas abatement opportunity adopted	Mitigation Hierarchy	Justification
<p>Small scale solar power generation</p> <p>Solar panels on office administration buildings to provide power to building</p> <p>Solar panels and batteries at remote well sites to provide power to well site.</p>	<p>Reduce</p>	<p>Installation of:</p> <ul style="list-style-type: none"> • solar panels and a heat pump on the administration building, and • solar panels and batteries at remote well sites. <p>The use of solar panels reduces the need to draw power from other sources.</p> <p>This considered good industry practice and design optimisation.</p>

4.2 MA 2 and MA 3 – WGP2 baseline emissions and NGER Act requirements

The Commonwealth Governments "Benchmark Baseline" concept for new industry projects, under the NGER Act 2007 has not been finalised at the time of submitting the GHGMP. Once in place it will enable MEPAU to apply for a 'baseline' of GHG emissions (tCO₂e).

The annual monitoring, auditing, and reporting of GHG emissions, as required by the NGER Act 2007, will then be used to measure ongoing performance and provide data to assist in the identification of improvement opportunities.

4.3 MA4 and MA5 – Interim Target and Aspirational Long-term Targets

4.3.1 Establishing Targets

MEPAU acknowledges that Interim Targets and Aspirational Long-term Targets, and associated timeframes, for the reduction of Scope 1 emissions (as detailed in EPA, 2020) are required to be included in the GHGMP.

MEPAU has carefully considered GHG emission reductions having regard to the existing Proposal design and lifecycle. Interim and Aspirational Targets are described in Section 4.3.2 and Section 4.3.3 and have been set to align with the State's Interim and Longer-term reduction targets.

4.3.2 Interim Targets

The West Australian Government has committed to work with the Commonwealth Governments interim target of GHG emission reductions of 26 % to 28 %, below 2005 levels, by 2030 at a national level.

MEPAU understands that the West Australian Government's commitment is set at a State-wide level, rather than at an individual project level. MEPAU recognises that GHG emission profiles vary considerably across industries and activities in Western Australia. That is, different industries and activities generate carbon emissions at varying intensities and/or generate carbon emissions differentially (i.e. GHG generated through operational processes or realisation of latent/imbedded GHG). Given these differences, industries and/or activities have a greater or lesser scope to avoid, reduce or offset GHG emissions.

MEPAU believes that, to assist the West Australian Government's commitment, different levels of contributions from industry and activities should be defined (effectively a strategy on how the State will meet this target). To achieve this, a State-wide technical assessment of how differing industries and/or activities can contribute to this commitment is required. Such a technical assessment will provide the State with the best opportunity to balance competing considerations in achieving the objectives of:

- Maximising the likelihood of achieving the State's reduction target,
- Minimising impacts to living standards, and
- Maximising strategic opportunities for future development (or changes) associated with a transition to a low carbon future.

The practical outcome of such a technical assessment is that some industries and/or activities will need to demonstrate reduction targets that mirror the Interim Target, while other industries (and associated activities) may need to demonstrate greater or lesser reductions. That is, a reduction target less than 26% to 28% by 2030 may be an appropriate outcome for some state important industries.

Data to support this technical assessment is not available at the individual project level and it is not feasible to expect individual projects to identify, collect and evaluate data on GHG profiles and GHG reduction opportunities for third party projects, let alone for different industries across the State. MEPAU will work collaboratively with the State, our industry peers, other industry sectors, and individual project proponents to assist the State in undertaking the required technical assessment.

Given that GHG policy and approaches continue to evolve at State and Commonwealth levels (GoWA, 2019 and EPA, 2020), MEPAU believes that the State will complete a technical assessment in the near future that will provide guidance to the remainder of industry.

However, in lieu of a detailed strategy on how the State will meet the required targets and how these apply to various industries and projects, Interim Targets have been developed to align with MEPAU's Climate Change Policy whilst supporting the Western Australian Governments current GHG emission reductions targets.

Given this position, Interim Targets proposed by MEPAU to contribute to the West Australian Government's commitment are:

Implement initiatives to achieve a reduction in baseline CO₂ emissions from the maximum production baseline, reduced to the average production levels for the period of production¹⁰, by either avoiding, reducing or offsetting¹¹ CO₂ emissions by:

- 10% by 2025, and
- 26% by 2030.

MEPAU notes that this commitment is being made even though the Waitsia Gas Plant is a new plant, designed in 2020 and therefore more efficient compared to those plants designed in 2005. Further, MEPAU considers its commitment to a 10% reduction in GHG emissions by 2025, which is only 2 years after the plant has commenced operating, to be a demonstration of its genuine intent to work with the State to contribute to achieving the interim target of GHG emission reductions of 26 % to 28 % by 2030.

4.3.3 Aspirational Long-term Targets

MEPAU believes that to establish meaningful Aspirational Long-term Targets and to detail MEPAU's contribution towards achieving net zero emissions by 2050, the state-wide technical assessment by the West Australian Government (detailed in Section 4.3.2) needs to extend out to 2050.

MEPAU is committed to the State's goal of zero net emissions by 2050. In order to develop meaningful Aspirational Long-term Targets, MEPAU will implement a program of rolling five-year review of national and international developments (the Long-term Target Review tied to

¹⁰ In the scenario where average production levels for the period of production (the Target reporting period) equals 250 TJ/day with an emission of 300,000 tCO₂-e per year (tCO₂-e/yr), assuming an average reservoir carbon dioxide (CO₂) concentration of 6.0 mol%, an exported gas production rate of 250 TJ/day and operation 365 days per year, baseline CO₂ emissions will be reduced by 30,000 tCO₂-e/yr by 2025 (to 270,000) and 78,000 tCO₂-e/yr by 2030 (to 222,000) from the initial baseline.

¹¹ MEPAU may source voluntary offsets, but will do so only from sources that are the equivalent standard to the Climate Active Carbon Neutral Standard (e.g. Gold Standard - Verified Emission Reductions (VERs) and Verified Carbon Standard - Verified Carbon Units (VCUs)).

the Target reporting periods) to enable it to define informed aspirational targets approximately ten years in advance. These rolling reviews will ensure that any future industry advances or technological developments can be taken into account when setting future Targets. Consequently, these Targets are more likely to be achievable and economically viable (rather than ambitious and hopeful). Accordingly, MEPAU intends to set targets for 2035 in 2025.

4.4 MA 6 and MA 7 – Preventative maintenance

MEPAU already implements preventative maintenance practices that are in line with good industry practices.

4.5 MA 8 – Adaptive Management

Section 5.0 further details the GHGMP approach to adaptive management.

5.0 ADAPTIVE MANAGEMENT

MEPAU have in place an adaptive management approach that will embed a continuous cycle of monitoring, evaluating, and implementing change (where appropriate), whilst maintaining ongoing reporting to ensure any relevant future improvement opportunities, not yet identified, will be captured and actioned.

The management actions presented in this GHGMP shall be monitored, evaluated, reviewed, and updated, as required, considering:

- Changes to the uncertainties or assumptions, as noted in Section 2.4.4,
- Evaluation of routine emissions monitoring data,
- Ensuring the implemented abatement delivers predicted emission reductions,
- New and relevant data/information gained as a result of implementing this GHGMP, or from external sources,
- Effectiveness of internal processes and procedures to reduce and manage GHG emissions,
- Changes in State or Commonwealth legislation or policy, and
- Monitoring and corrective actions

GHG emissions will be monitored during operation. Any non-conformances to the targets outlined in Table 3-1 will be reported, investigated, rectified or mitigated as soon as possible to ensure ongoing mitigation of GHG emissions. Where relevant, procedures will be amended or updated, and inductions and other workforce communication will be undertaken in a timely manner to minimise the risk of re-occurrences.

5.1 GHGMP review

MEPAU intends this GHGMP to be dynamic and it may be updated to reflect changes in management practices, technologies, the natural environment and government policy over time. This will also allow flexibility to adopt new technologies and/or management measures.

MEPAU will review and evaluate the management actions outlined in this management plan every three years (Adaptive Management Review), from date of endorsement, to ensure the actions are adequately addressing the relevant key risks and meeting State and/or Commonwealth legislation and policy. This GHGMP may also be revised by MEPAU prior to the three-year interval on an as needs basis. This may be due to the management actions not achieving the desired outcomes, monitoring which identifies a variation to predicted emissions or an opportunity for improvement, changes to relevant legislation, or improvements to practices which may achieve improved environmental outcomes.

When the three-yearly review cycle is triggered, or an as needs review is undertaken, a revised GHGMP will be submitted, approved and published in accordance with any Ministerial Statement condition requirements.

MEPAU also commits to reviewing this GHGMP under the following circumstances:

- If a new process or activity is proposed to be introduced that has the potential to alter the emissions from the Proposal above the baseline emission or is not in accordance with this GHGMP, and

- Following the release of State strategies on climate change, energy transformation and State targets particularly as relevant for the industry sector.

5.2 Timeline for Adaptive Management

An overview of the various actions, review and reporting requirement that will feed into the adaptive management process is included as Table 5-1.

Table 5-1 Adaptive Management Timeline

Year	MEPAU action	Policy release (anticipated)
2020	GHGMP updated to reflect Part IV EP Act assessment and approval outcomes	WA Whole of System Plan – Energy Transformation Strategy (Q3) (GoWA, 2019b) State Climate Policy
2021	Review status/forecast of policies, markets, technology and regional infrastructure	
2023	Forecast date of plant start-up	-
2024 and annually thereafter	Review abatement opportunities	-
2025	Interim Target Reporting Establishment of Aspirational Long-term Target to 2035.	
2026 and tri-annually thereafter	Triennial review of status/forecast of policies, markets, technology and regional infrastructure	-
2030	Interim Target Reporting Establishment of Aspirational Long-term Target to 2040.	
2031	Plan procurement for Gas Processing Plant major 10-year maintenance / refit milestone	-
2032	Implement procurement for Gas Processing Plant major 10-year maintenance/ refit milestone	-
2033	Implement construction for Gas Processing Plant major 10-year maintenance/ refit milestone	-
2035	Aspirational Long-term Target Reporting Establishment of Final Aspirational Long-term Target to 2043 (i.e. WGP life planned to end 2043).	
2040	Aspirational Long-term Target Reporting	
2043	Final Aspirational Long-term Target Reporting	

6.0 STAKEHOLDER CONSULTATION

Consistent with the EPA's expectations for the GHGMP to align with the principles of EIA, MEPAU consulted with stakeholders, including but not limited to DWER during the development of the EPA referral. MEPAU will continue to maintain effective communication with local and regional stakeholders throughout the delivery of the Proposal.

A summary of stakeholder engagement completed as of August 2019 is provided in Table 3-1 of the *Environmental Referral Supporting Report* (MEPAU 2019d).

Any additional consultation regarding the GHGMP will be captured in subsequent revisions of the GHGMP.

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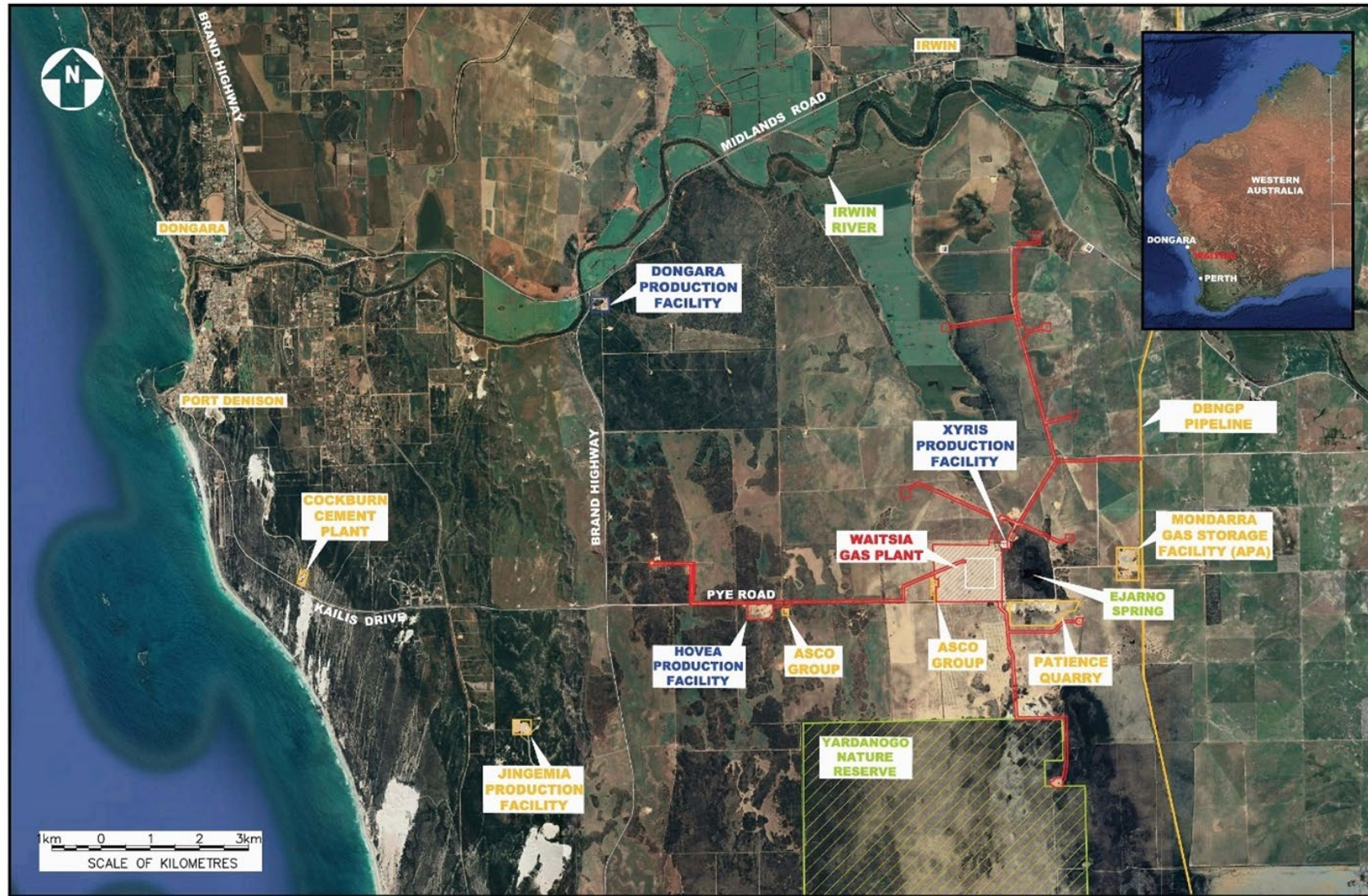
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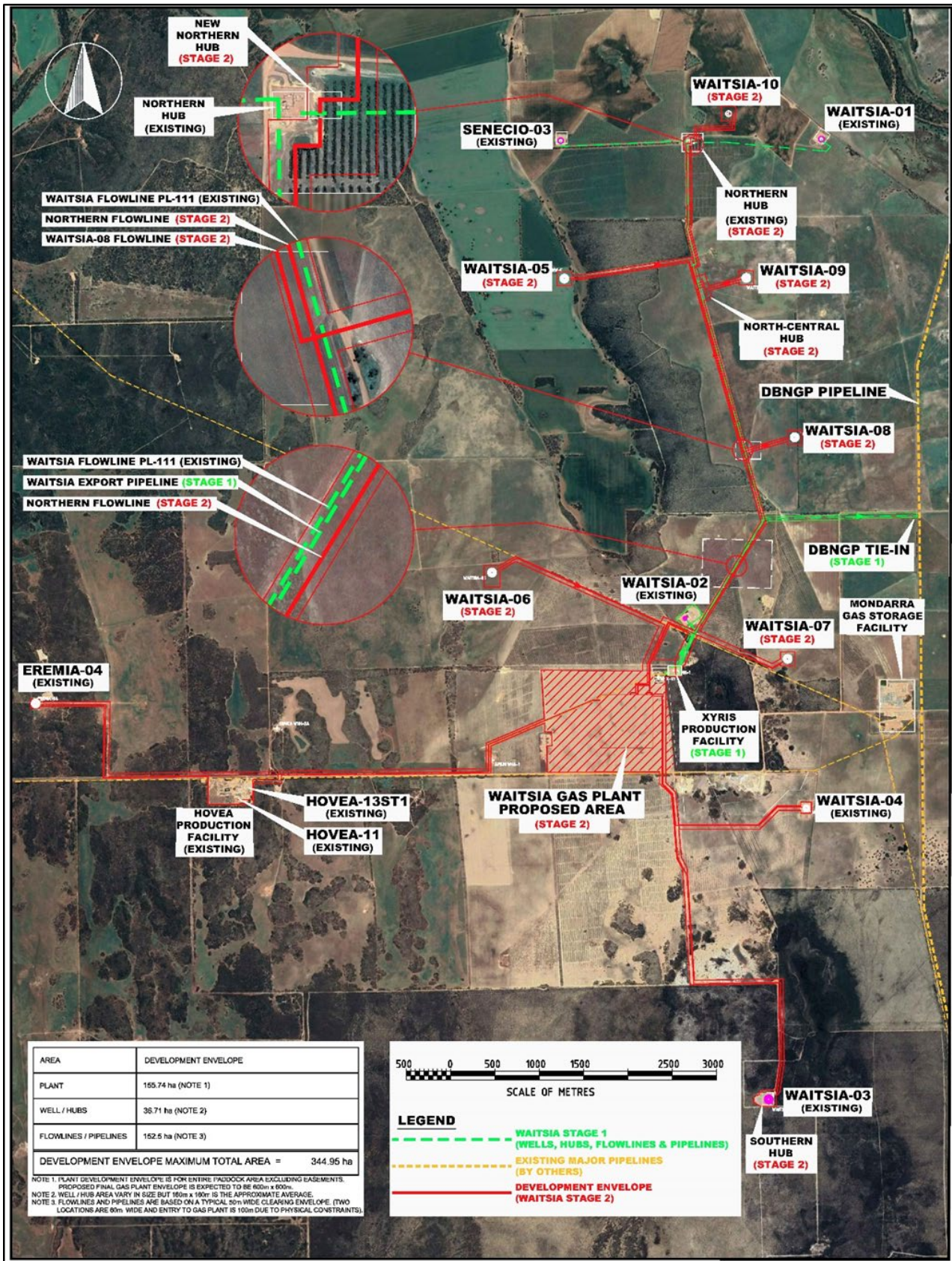
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ATTACHMENTS

APPENDIX 1: WGP2 - REGIONAL SETTING



APPENDIX 2: WGP2 - LOCAL SETTING



APPENDIX 3: MEPAU CLIMATE CHANGE POLICY



CLIMATE CHANGE POLICY

Objective

Mitsui E&P Australia (MEPAU) recognises that climate change presents a significant global challenge. MEPAU is committed to being a part of the solution by providing safe, reliable and affordable energy whilst mitigating greenhouse gas emissions.

We believe that a variety of energy sources are required to meet the world's energy demand and that natural gas, in particular, will play an increasingly important role globally in the energy mix due to its relatively low environmental load compared to other fossil fuels. Moreover, developing energy resources can provide significant economic and social benefits.

Policy Commitments

To achieve our objective, MEPAU is committed to:

- Working with governments and stakeholders in the design of climate change regulation and policies;
- Incorporating climate change risks into our decision-making and business operations;
- Identifying, evaluating and implementing, solutions to mitigate greenhouse gas emissions having regard to the as low as reasonably practicable principle and to fuel efficiency initiatives, in our existing operations and new projects; and
- Measuring and reporting greenhouse emissions as required by the regulation of the jurisdictions we operate in.

This policy will be reviewed regularly and updated as required.

Revision approved on 27 February 2020