Gorgon Gas Treatment Plant Greenhouse Gas Management Plan

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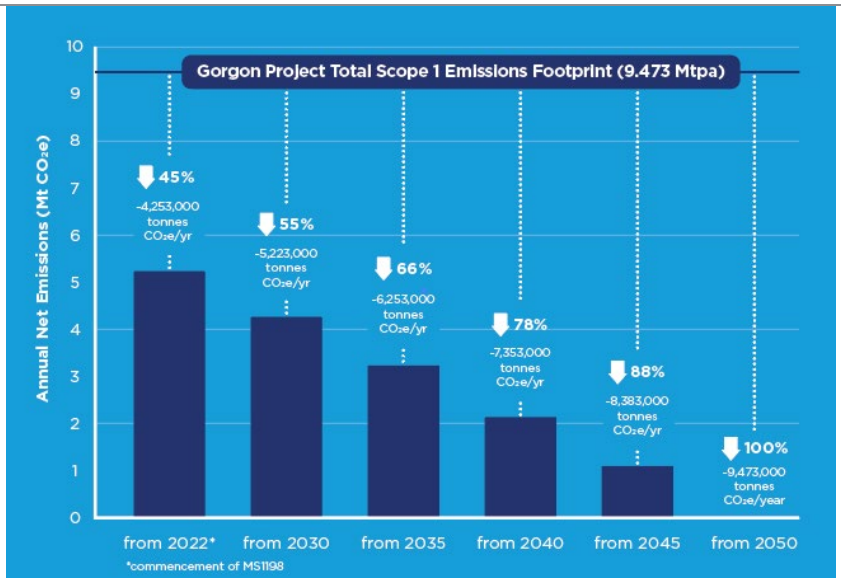
1 executive summary

Table 1-1: Gorgon Gas Treatment Plant Greenhouse Gas Management Plan summary table

Proposal name	Gorgon Gas Development Revised and Expanded Proposal: Barrow Island Nature Reserve
Proponent name	Chevron Australia Pty Ltd (CAPL)
Proposal description and scope	The construction of facilities for the development of the Greater Gorgon Gas Fields on the North West Shelf, and the processing and export of the gas at a liquefied natural gas (LNG) plant to be constructed on Barrow Island, as more generally described in the Draft Environmental Impact Statement / Environmental Review and Management Programme for the Proposed Gorgon Development, the Final Environmental Impact Statement/ Response to Submissions on the Environmental Review and Management Programme; as amended under Section 45C; and as expanded and revised in the Public Environmental Review for the Gorgon Gas Development Revised and Expanded Proposal and the Response to Submissions: Gorgon Gas Development Revised and Expanded Proposal, Public Environmental Review.
Key Environmental Factor	Greenhouse Gas Emissions
EPA Objective	The environmental objective of 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.
Purpose of the GHG EMP	The purpose of this Greenhouse Gas Management Plan (GHGMP) is to satisfy the requirements of condition 27 of MS 800 (as amended by MS 1198).
Emissions estimates	Scope 1 emission estimates for the Gorgon Gas Treatment Plant (GGTP) include: • average annual emissions of 9.473 Mtpa CO_2-e • life of proposal emissions of 211 Mt CO_2-e There are currently no scope 2 emissions associated with the GGTP.
Trajectory of emissions reductions	CAPL will take measures to reduce Net GHG Emissions from the GGTP in accordance with condition27.1 of MS 800 (as amended by MS 1198) and illustrated below: Condition 27.1. Subject to condition 27.2, the proponent shall take measures to ensure that Net GHG Emissions do not exceed: (a) 5,220,000 tonnes of CO2-e / year for the period until 30 June 2030; (b) 4,250,000 tonnes of CO2-e / year for the period between 1 July 2030 and 30 June 2035; (c) 3,220,000 tonnes of CO2-e / year for the period between 1 July 2035 and 30 June 2040; (d) 2,120,000 tonnes of CO2-e / year for the period between 1 July 2040 and 30 June 2045; (e) 1,090,000 tonnes of CO2-e / year for the period between 1 July 2045 and 30 June 2050; and in any event; and (f) zero tonnes of CO2-e / year for every five year period from 1 July 2050 onwards.

	
Other statutory decision-making processes that require reduction in GHG emissions	The GGTP is subject to emissions baselines established under the Australian Government's Safeguard Mechanism (SGM).
Key components in the GHG EMP	**GHG mitigation actions in design** GHG emissions management was integrated into the design basis of the Gorgon Gas Development and a range of facilities and practices were adopted to avoid emissions through best practice design. **GHG mitigation actions in operation (to 2035)** CAPL recognises the importance of innovation and continuing to apply mitigations through the subsequent steps of the mitigation hierarchy as critical to the success of achieving its interim and long-term emissions reduction targets. This includes continuous improvement to reduce emissions over the life of the project through Chevron's CO2 Injection System and GHG Optimisation Process and by offsetting emissions through the implementation of a GHG emissions offset package. **GHG mitigation actions in operation (beyond 2035)** Beyond 2035 there is greater uncertainty on the level of emissions reductions that may be achieved owing to a number of factors such as outcomes of GHG optimisation projects, realisation of technological advancements and availability of offsets. Information on the potential mitigation actions proposed for the post-2035 period will be outlined in future updates of the GGTP GHGMP and will reflect strategies and measures reasonably practicable at the time, noting the expectation that potential mitigations will develop over time and more effective mitigation alternatives may become available.
GHG EMP reviews and reporting	Monitoring, auditing and public reporting of GHG emissions from the GGTP will be carried out in accordance with MS 800, including: • annual reporting per condition 27.2; and • five-yearly reporting per condition 27.3. This Plan will be reviewed and updated based on the results of adaptive management reviews and, as a minimum, every five years as required by condition 27.6 of MS 800 (as amended by MS 1198).
Proposed project end of life/ decommissioning date	FY2066

2 introduction

2.1 project overview

Chevron Australia Pty Ltd (CAPL) is the operator for the Gorgon Gas Development (also known as the Gorgon Project) on behalf of the Gorgon Joint Venture (GJV). The Project involves development of gas reserves from the Greater Gorgon Area for processing in the Gorgon Gas Treatment Plant (GGTP) on Barrow Island, which is located off the Pilbara coast in Western Australia (WA) (Figure 2-1).

Subsea gathering systems and pipelines deliver feed gas from the Gorgon and Jansz–Io gas fields to the west coast of Barrow Island. The underground feed gas pipeline system then traverses Barrow Island to the east coast where the GGTP is located. The GGTP includes natural gas trains that produce liquefied natural gas (LNG) as well as condensate and domestic gas (Domgas). Carbon dioxide (CO_2), which occurs naturally in the feed gas, is separated during the production process and injected into deep rock formations below Barrow Island. The LNG and condensate are loaded onto tankers from a jetty and then transported to international markets. Gas for domestic use is exported by pipeline from Barrow Island to the domestic gas collection and distribution network on the WA mainland.

2.2 environmental approvals

The initial Gorgon Gas Development was assessed through an Environmental Impact Statement/Environmental Review and Management Programme assessment process (Ref. 1; Ref. 2).

The Jansz Feed Gas Pipeline was approved by the WA Minister for the Environment on 28 May 2008 by way of Ministerial Statement No. 769 (MS 769; Ref. 3) and by the Commonwealth Minister for the Environment and Water Resources on 22 March 2006 (EPBC 2005/2184; Ref. 4).

On 10 August 2009 the WA Minister for the Environment issued Ministerial Statement No. 800 (MS 800; Ref. 5), granting approval for the Revised and Expanded Gorgon Gas Development. MS 800 provides approval for both the initial Gorgon Gas Development and the Revised and Expanded Gorgon Gas Development, which together are known as the Gorgon Gas Development.

Since the Revised and Expanded Gorgon Gas Development was approved, further changes to the Gorgon Gas Development have been made and/or approved and are now also part of the Development. These include Ministerial Statement No. 965 (MS 965; Ref. 6), which applies the conditions of MS 800 for an Additional Construction Laydown and Operations Support Area, and Ministerial Statement No. 1002 (MS 1002; Ref. 7), which applies the conditions of MS 800 as amended by Ministerial Statement No. 865 (MS 865; Ref. 8) for the Fourth Train Expansion Proposal. Ministerial Statement No. 1136 (MS 1136; Ref. 9) was issued on 29 May 2020 to amend Condition 26.2 following a section 46 review. Ministerial Implementation Statement No. 1198 (MS 1198, Ref. 10) was issued on 20 October 2022 to amend conditions 5, 26 and 27 following the WA Environmental Protection Authority's (EPA) inquiry under section 46 of the *Environmental Protection Act 1986* (WA; EP Act) into the adequacy of Gorgon Gas Development's existing implementation conditions with respect to avoiding, reducing and offsetting GHG emissions.

References to MS 800 throughout this Plan refer to MS 800 inclusive of the amendments outlined above.

2.3 proponent

CAPL is the proponent and the person taking the action for the Gorgon Gas Development on behalf of the following companies (collectively known as the Gorgon Joint Venturers [GJVs]), pursuant to MS 800 and MS 965:

- Chevron Australia Pty Ltd
- Shell Australia Pty Ltd
- Mobil Australia Resources Company Pty Limited
- Osaka Gas Gorgon Pty Ltd
- Tokyo Gas Gorgon Pty Ltd
- JERA Gorgon Pty Ltd.

CAPL is also the proponent and the person taking the action for the Jansz Feed Gas Pipeline on behalf of the GJVs, pursuant to MS 769.

2.4 location

The Gorgon gas field is located ~130 km and the Jansz–Io gas field ~200 km off the north-west coast of WA. Barrow Island is located off the Pilbara coast ~85 km north-north-east of Onslow and ~140 km west of Karratha. Barrow Island is ~25 km long and 10 km wide and covers 23,567 ha.

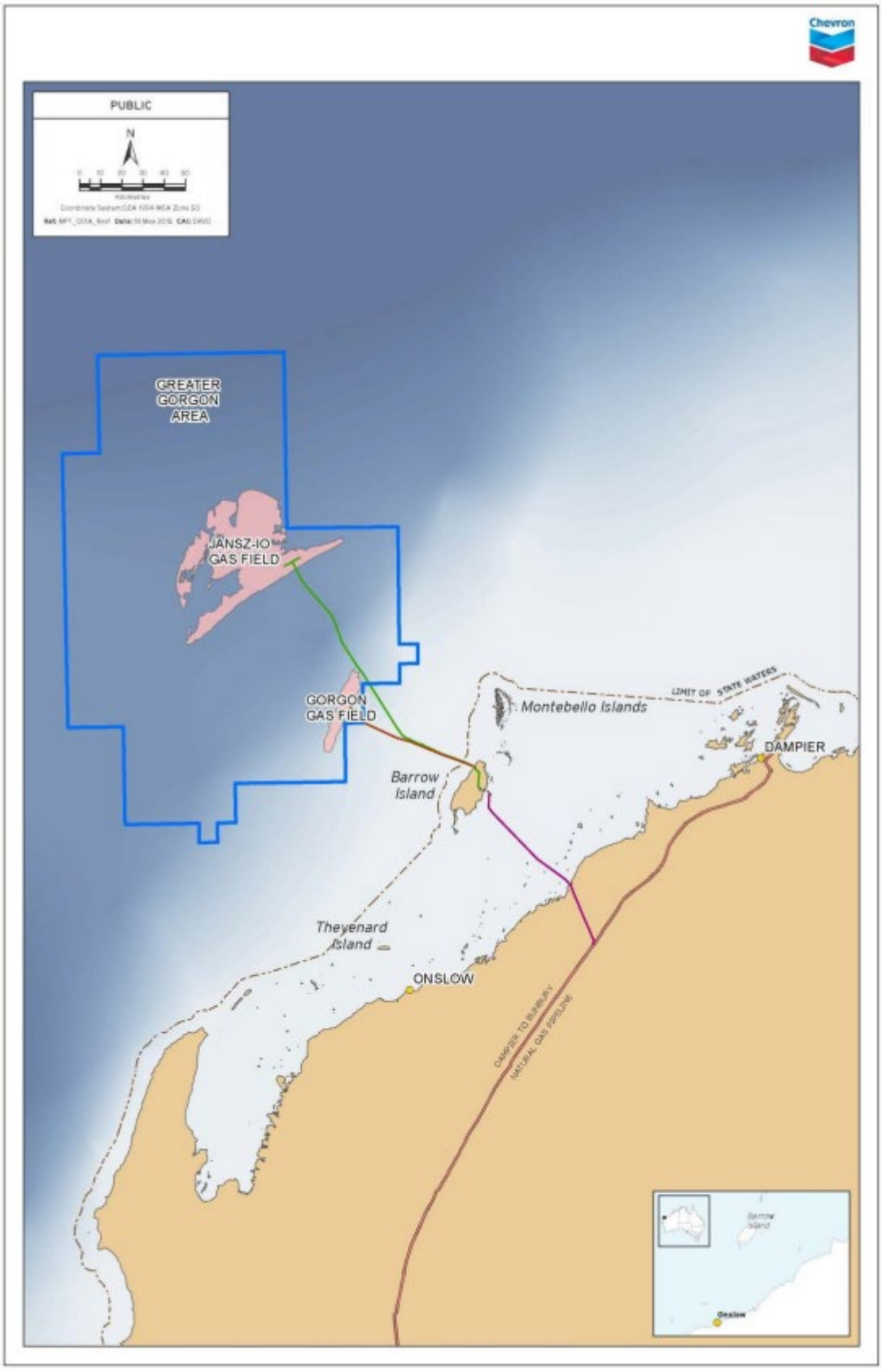


Figure 2-1: Project location

2.5 scope

This plan is applicable to all scope 1 greenhouse gas (GHG) emissions from the current operational Gorgon Gas Development facilities outlined in MS 800. This includes all Scope 1 emissions from the GGTP trains 1, 2 and 3, DomGas Unit, Carbon Dioxide Injection System, and associated terrestrial facilities such as the accommodation facility, utilities area and waste transfer station. These facilities are described in further detail below in Section 4.1. For clarity, the in-scope facilities are referred to as the GGTP throughout this Plan.

There are currently no scope 2 emissions associated with the GGTP and this Plan also does not apply to:

- Scope 3 emissions such as emissions associated with final combustion and use of LNG, DomGas and condensate products by customers, as well as emissions from the transport of products to customers. Refer to Appendix A for an estimate of scope 3 emissions for the Gorgon Gas Development;
- emissions from activities or facilities in Commonwealth waters; and
- emissions from an additional LNG train or associated facilities that are yet to be constructed (MS 1002 provides for the Fourth Train Expansion Proposal).

2.6 purpose and objective

The purpose of this GGTP Greenhouse Gas Management Plan (GHGMP) is to satisfy the requirements of condition 27 of MS 800 (as amended by MS 1198).

The objective of this Plan is to outline:

- measures implemented through the design and early phase of operations to avoid or reduce GHG emissions;
- measures to avoid, reduce and offset scope 1 GHG emissions during operations over the life of the proposal; and
- emission limits, required by condition 27.1, for scope 1 GHG emissions from the GGTP over the life of the proposal.

2.7 condition requirements

Table 2-1 lists the State condition requirements of this Plan and the sections in this Plan that fulfill them.

Table 2-1: Condition requirements reservoir

Approval Decision	Condition Number	Condition Requirement	Section in this Plan
MS 1198	27.1	Subject to condition 27.2, the proponent shall take measures to ensure that Net GHG Emissions do not exceed: (a) 5,220,000 tonnes of CO2-e / year for the period until 30 June 2030; (b) 4,250,000 tonnes of CO2-e / year for the period between 1 July 2030 and 30 June 2035; (c) 3,220,000 tonnes of CO2-e / year for the period between 1 July 2035 and 30 June 2040; (d) 2,120,000 tonnes of CO2-e / year for the period between 1 July 2040 and 30 June 2045; (e) 1,090,000 tonnes of CO2-e / year for the period between 1 July 2045 and 30 June 2050; and in any event; and (f) zero tonnes of CO2-e / year for every five year period from 1 July 2050 onwards	4.5
MS 1198	27.2	The proponent shall submit a report to the CEO each year by 31 March, commencing on the first 31 March after the date of this Statement, verifying for the previous financial year: (a) the quantity of Proposal GHG Emissions, Reservoir Carbon Dioxide, and Non-Reservoir GHG Emissions; (b) the quantity of Reservoir Carbon Dioxide that has been injected underground in accordance with condition 26; (c) the number of terajoules of gas processed at the proposal facility; (d) the number of terajoules of gas produced from the proposal facility determined in accordance with NGER Item 30(1); and (e) Proposal GHG Emissions Intensity and Non-Reservoir GHG Emissions Intensity, including calculations and calculation methodology for each.	7
MS 1198	27.3	The proponent shall submit to the CEO by 31 March 2026, and every fifth 31 March thereafter: (1) a consolidated report specifying: (a) for each of the preceding five (5) financial years, the matters referred to in conditions 27.2(a) to 27.2(e); (b) for the period comprising five (5) financial years which ended on 30 June in the year before the report is due: i. the quantity of Reservoir Carbon Dioxide that has been injected underground in accordance with condition 26; ii. the amount of Non-Reservoir GHG Emissions that have been avoided or reduced through a Certified Improvement, including describing the Certified Improvement that caused the avoidance or reduction; iii. the type, quantity, identification or serial number, and date of retirement or cancellation of any Authorised Offsets which have been retired or cancelled, including written evidence of such retirement or cancellation; iv. the progress towards meeting the interim and long-term reduction targets for Proposal GHG Emissions as specified in the Greenhouse Gas Management Plan; v. any measures that have been implemented to avoid or reduce Proposal GHG Emissions; vi. identifies any shortfall in injection of Reservoir Carbon Dioxide;	7

Approval Decision	Condition Number	Condition Requirement	Section in this Plan
		vii. identifies the periods when Reservoir Carbon Dioxide was not injected underground, and the corresponding quantities that was not injected underground during those periods; viii. identifies, quantifies, and establishes the shortfall that complies with conditions 26.1(a) and 26.1(b) and identifies and justifies the reasons why the shortfall complies; ix. identifies any additional measures that could be implemented in the future to ensure that at least 80 per cent of Reservoir Carbon Dioxide is injected underground (if any) and the timeframe for implementation of those measures; and x. contains recorded data sets from which the information referred to in conditions 27.3(1)(b)i to 27.3(1)(b)viii was derived in Excel format or some other format approved by the CEO. (2) a report of a peer review carried out by an independent person or independent persons with suitable technical expertise to review the matters referred to in conditions 27.3(1)(b)i to 27.3(1)(b)x which includes a review of the suitability of the methodology used to review the matters set out in the report, whether the report is accurate and whether the report is supported by any credible evidence. (3) a report if the proponent has not injected underground 80 per cent of Reservoir Carbon Dioxide that: i. specifies the measures it implemented to comply with condition 26.1; ii. why those steps were insufficient to ensure that 80 per cent of Reservoir Carbon Dioxide was injected underground for the relevant period; iii. any additional measures that could be taken into the future to ensure at least 80 per cent of Reservoir Carbon Dioxide is injected underground; and iv. which of the measures in condition iii the proponent intends to take and a timeframe for the taking of those measures. (4) a report of a peer review carried out by an independent person or independent persons with suitable technical expertise to review the matters referred to in conditions 27.3(3)i to 27.3(3)iii.	
MS 1198	27.4	Subject to, and to the extent that it is consistent with the achievement of the limits in, or the achievement of emissions reductions beyond those required by condition 27.1 or condition 27.2, the proponent shall implement: (a) The Gorgon Gas Treatment Plant Greenhouse Gas Management Plan (ABU220200238, Revision 2.0) dated 17 August 2022; or (b) if that plan has been revised, the latest version of the plan that the CEO has confirmed in writing meets the requirements of condition 27.7.	This Plan
MS 1198	27.5	A summary document comprising of a summary plan and progress statement outlining key information from the Greenhouse Gas Management Plan (and reports to that time) must be submitted to the CEO every five (5) years as per	7

Approval Decision	Condition Number	Condition Requirement	Section in this Plan
		condition 27.3 and also if the Greenhouse Gas Management Plan is revised under condition 27.6. The summary must include: (a) a graphical comparison of Proposal GHG Emissions reduction commitments in the Greenhouse Gas Management Plan to achieve the required reduction in Proposal GHG Emissions by 2030 and net-zero Proposal GHG Emissions by 2050 with 'actual' Proposal GHG Emissions for compliance periods; (b) proposal performance against benchmarking for comparable facilities; (c) Proposal GHG Emissions Intensity and Non-Reservoir GHG Emissions Intensity; (d) a summary of emission reduction measures undertaken by the proponent; and (e) a clear statement as to whether interim targets have been achieved.	
MS 1198	27.6	The proponent: (a) may revise a Greenhouse Gas Management Plan at any time; (b) must revise the Greenhouse Gas Management Plan if there is a change to the proposal which means that there is a material risk that condition 27.1 will not be achieved; (c) must revise the Greenhouse Gas Management Plan at least every five years to align with the five (5) yearly reporting requirements specified in condition 27.3; (d) must revise a Greenhouse Gas Management Plan if directed to by the CEO, within the time specified by the CEO; (e) must revise the Gorgon Gas Treatment Plant Greenhouse Gas Management Plan (ABU220200238, Revision 2.0) dated 17 August 2022 as required by condition 27.7; and (f) with any revision, must prepare a summary of the Greenhouse Gas Management Plan which includes a summary of the matters in condition 27.7.	9
MS 1198	27.7	Within six (6) months of the date of this Statement, the proponent shall submit a revised Greenhouse Gas Management Plan referred to in condition 27.6 to the CEO that: (a) is consistent with the achievement of the limits in, or the achievement of emissions reductions beyond those required by condition 27.1, and with the other requirements of condition 27; (b) specifies the estimated Proposal GHG Emissions, Reservoir Carbon Dioxide, Non-Reservoir GHG Emissions, Proposal GHG Emissions Intensity and Non-Reservoir GHG Emissions Intensity for the remainder of the life of the proposal; (c) includes comparison of each of the estimated Proposal GHG Emissions and Proposal GHG Emissions Intensity figures referred to in condition 27.7(b) for the remainder of the life of the proposal against other comparable projects; (d) specifies the estimated number of terajoules of gas to be processed at the proposal facility for the remainder of the life of the proposal; (e) specifies the estimated number of terajoules of gas to be produced at the proposal facility as determined in accordance with NGER Item 30(1) for the remainder of the life of the proposal;	This Plan a) 4.5 b) 4.2 c) 4.3 d) 4.2 e) 4.2 f) 6 g) 4.5 h) 9

Approval Decision	Condition Number	Condition Requirement	Section in this Plan
		(f) includes where practicable, the adoption of advances in technology and operational processes that the proponent will implement to avoid, reduce, and/or offset Proposal GHG Emissions, Reservoir Carbon Dioxide or Non-Reservoir GHG Emissions, and/or reduce Proposal GHG Emissions Intensity; (g) specifies interim and long-term targets for avoiding, reducing and/or offsetting Proposal GHG Emissions; and (h) provides for a program for the future review of the plan to: i. assess the effectiveness of the advances in technology and operational processes referred to in condition 27.7(f); and ii. identify and describe options for future advances in technology and operational processes that the proponent may or could implement to avoid, reduce and/or offset Proposal GHG Emissions, Reservoir Carbon Dioxide or Non-Reservoir GHG Emissions, and/or reduce Proposal GHG Emissions Intensity.	
MS 1198	27.8	For the life of the proposal, the proponent shall make all Greenhouse Gas Management Plans and the reports (including summary plans and progress statements) publicly available within the specified timeframes on the proponent's website for the life of the proposal, or in any other manner specified by the CEO, within a time specified by the CEO: (a) the Greenhouse Gas Management Plan referred to in condition 27.4(a) within two (2) weeks of the issue of the Statement; (b) the revised Greenhouse Gas Management Plan referred to in condition 27.7 and summary plan referred to in condition 27.6(f) within two (2) weeks of receiving confirmation from the CEO as referred to in condition 27.4(b); (c) the report referred to in condition 27.2 within two (2) weeks of submitting a relevant report to the CEO; (d) the reports, summary plans and progress statements referred to in conditions 27.3 and 27.5 within two (2) weeks of submitting the relevant reports, summary statements and progress reports to the CEO; and (e) any revised Greenhouse Gas Management Plan referred to in condition 27.6 and the summary plan referred to in condition 27.6(f) within two (2) weeks of receiving confirmation from the CEO as referred to in condition 27.4(b).	8

3 internal and external legal and policy frameworks

3.1 Commonwealth policy and requirements

In October 2021, the Commonwealth Government released Australia's Long-Term Emissions Reduction Plan, which outlined its plan to achieve net zero emissions by 2050 (Ref. 11). On 16 June 2022, the Prime Minister and the Minister for Climate Change and Energy submitted a new Nationally Determined Contribution to the United Nations, which formally committed Australia to reducing carbon emissions by 43% based on 2005 levels (Ref. 33). The Australian Government introduced the *Climate Change Bill 2022* in 2022, which received assent on 13 September 2022. The *Climate Change Act 2022* (Cth) (Climate Act) and the *Climate Change (Consequential Amendments) Act 2022* (Cth) (Consequential Amendments Act) came into effect on 14 September 2022. The Climate Act legislates emissions reduction targets for Australia of 43% from 2005 levels by 2030 and net zero emissions by 2050.

The Emissions Reduction Fund (ERF) incentivises businesses to cut the amount of GHGs they create and to undertake activities that store carbon. It has three key elements: crediting, purchasing, and safeguarding emission reductions. CAPL participates in the ERF and is registered as the 'Gorgon Operations Facility' with the Clean Energy Regulator (CER). The ERF was established through the Commonwealth *Carbon Credits (Carbon Farming Initiative) Act 2011* (Ref. 12).

The National Greenhouse and Energy Reporting (NGER) Scheme is a single national framework for reporting company information about GHG emissions, energy production and energy consumption and is administered through the *National Greenhouse and Energy Reporting Act 2007* (NGER Act) and associated regulations (Ref. 13).

The Commonwealth Government's Safeguard Mechanism (SGM), which took effect in 2016, was also established as part of the ERF. The SGM builds on the NGER scheme's reporting and record keeping requirements. The SGM is administered by the CER in accordance with the *National Greenhouse and Energy Reporting (Safeguard Mechanism) Rule 2015* (Safeguard Rule) (Ref. 14) and applies to all facilities with direct emissions over 100,000 tonnes per annum carbon dioxide equivalent (CO_2-e).

The SGM currently requires Australia's largest GHG emitters to keep their net emissions below an emissions limit (a baseline). The Australian Government is currently reforming the SGM to reduce emissions limits, predictably and gradually on a trajectory consistent with achieving net zero by 2050. The *Safeguard Mechanism (Crediting) Amendment Bill 2023* was passed on 31 March 2023. It amends the NGER Act and other legislation to establish the framework to give effect to key elements of the reforms, such as introducing credits to the scheme to provide an incentive to facilities to go beyond their baselines. According to the Department of Climate Change, Energy, the Environment and Water (DCCEEW) website, following passage of the Bill, the Government intends to amend the Safeguard Rules and other relevant subordinate legislation in April 2023, enabling the reformed scheme to commence on 1 July 2023.

Under the NGER and SGM schemes, the scope of the 'Gorgon Operations Facility' includes both the onshore Gas Treatment Plant (GTP) and associated facilities, as well as any emissions from activities or facilities in Commonwealth waters. The current SGM baseline for the Gorgon Operations Facility is 8.37 MTPA CO_2-e per financial year. This current Gorgon Operations Facility

baseline commenced 1 July 2021 and is a calculated emissions baseline under the production-adjusted baseline criteria.

This GGTP GHGMP is intended to complement, rather than duplicate, Commonwealth GHG requirements. To the extent that additional Commonwealth GHG requirements are introduced, which overlap with the GGTP GHGMP long-term emission targets, the Commonwealth requirements will take effect and this GGTP GHGMP will be amended to avoid inconsistency with, or duplication of, the regulation. This is consistent with the State GHG Policy's aim to complement, rather than duplicate, the Commonwealth Government's climate change policy framework (Ref. 16).

3.2 State policy

The Western Australian Climate Policy sets out the State Government's plan for a climate-resilient community and a prosperous low-carbon future (Ref. 16). The policy underscores the Western Australian government's commitment to adapting to climate change and working to achieve net zero GHG emissions by 2050.

On 28 August 2019, the State Government released its GHG Emissions Policy for Major Projects assessed by the EPA (Ref. 17). This Policy requires new proposals or expansions undergoing environmental impact assessment under the *Environmental Protection Act 1986* (WA) to develop a GHGMP that sets interim and long-term emission reduction targets and outlines their contribution to the State's net zero aspiration.

The EPA released an Environmental Factor Guideline (EFG) relating to GHG Emissions in April 2020. In July 2021 the EPA commenced its review of the EFG and on 5 April 2023 published its revised EFG (Ref. 18). The environmental objective of the EFG is to minimise the risk of environmental harm associated with climate change by reducing GHG emissions as far as practicable. The EFG outlines when and how the GHG EFG is considered by the EPA under Part IV of the EP Act (Ref. 19). The EFG states that when the EPA applies the guideline in assessing a proposal, the EPA will require proponents to develop a GHGMP as part of the assessment process that meets the EPA's objective. The EFG provides guidance on the content of a GHGMP. This guidance has been addressed in this Plan where it is relevant to a GHGMP required under condition 27 of MS 800.

This Plan was initially provided to inform the EPA's inquiry into the adequacy of Gorgon Gas Development's existing implementation conditions with respect to avoiding, reducing and offsetting GHG emissions and is now provided to meet the requirements of condition 27 of MS 800.

3.3 corporate context

As outlined in Chevron Corporation's Climate Change Resilience report (Ref. 20), Chevron Corporation (Chevron) supports the Paris Agreement and its goal of 'holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 °C above pre-industrial levels'. Chevron's strategy employs a global approach in order to achieve the goals of the Paris Agreement as efficiently and cost-effectively as possible. Chevron believes that the optimal approach for society is to drive the most efficient and cost-effective reductions economywide, paired with natural and technological emissions removal. Chevron supports a price on carbon, applied as widely and broadly as possible, as the best approach to reduce emissions. To this end, Chevron supports international linkages (for example,

through Article 6 of the Paris Agreement), with the goal of ultimately building up to a liquid and integrated global carbon market.

At Chevron, we believe the future of energy is lower carbon. We will accomplish our energy transition goals with our strong governance, risk management, business strategy and climate policy principles, coupled with actions and investments. Our primary objective is to deliver higher returns, lower carbon, and superior shareholder value in any business environment. Chevron's strategic planning process supports an ability to operate in a lower carbon policy environment. For example, we use carbon prices and derived carbon costs in business planning, investment decisions, impairment reviews, reserves calculations, and evaluation of carbon-reduction and new energy opportunities.

4 GHG emissions profile

4.1 facility description and GHG sources

The facilities referred to as the 'Gorgon Gas Treatment Plant' include:

- three nominal 5.2 MTPA LNG processing trains
- domestic gas unit (Domgas) with a nominal capacity to supply ~300 TJ/day
- five 116 MW (nominal) Frame 9 Gas Turbine Generators (GTGs)
- six 80 MW (nominal) Frame 7 Process Gas Turbines (GTs)
- two LNG storage tanks
- four condensate storage tanks
- carbon dioxide injection system
- jetty for LNG and condensate loading into tankers
- operations and maintenance buildings
- associated infrastructure and support activities, including the accommodation facility, utilities area and waste transfer station.

Key sources of GHG emissions within the GGTP include:

- gas turbines
- power generation gas turbines generators
- acid gas removal units (AGRU)
- fired heaters
- flaring and venting
- other sources such as diesel for transport and machinery, tugs and pilot vessels and back-up power generation at the accommodation facility, and fugitive emissions

4.2 Gorgon Gas Treatment Plant GHG estimated emissions data

The Fourth Train Expansion Proposal Public Environmental Review/ Draft Environmental Impact Statement (PER/Draft EIS), outlined an annual estimated emission rate of 9.473 MTPA CO_2-e for three LNG trains (Ref. 21). This estimate included long-term average annual net emissions of 6.073 MTPA and 3.4 MTPA attributed to CO_2 injection.

The Fourth Train Expansion Proposal PER/Draft EIS (Ref. 21), submitted to the EPA in 2014 and approved by way of MS 1002 in 2015, forecast an emission intensity for the Gorgon Foundation Project of 0.39 t CO_2-e/t LNG. This was a forecast intensity, averaged over the life of the Project. Emissions estimations were based on an average of the anticipated steady-state operating scenarios and a single number was provided to represent the life of the Project. Therefore, this forecast emissions intensity was not intended to represent initial years where the facility was still in commissioning or early stages of operation.

Table 4-1 provides the estimated Proposal GHG Emissions, Reservoir Carbon Dioxide, Non-Reservoir GHG Emissions, Proposal GHG Emissions Intensity and Non-Reservoir GHG Emissions Intensity for the remainder of the life of the

proposal, as required by condition 27.7 of MS 800. The Proposal GHG Emissions Intensity figure, whilst similar, is higher than the forecast emissions intensity provided in the Fourth Train Expansion Proposal PER/Draft EIS (Ref. 21). This is related to the use of updated forecast production and emissions data and a different averaging period.

Table 4-1: Estimated emissions data for the remainder of the of the life of the Proposal

Estimated emissions data for the remainder of the life of the Proposal[1]	
Proposal GHG Emissions	211 MT CO_2-e
Net Proposal GHG Emissions	92 MT CO_2-e
Reservoir Carbon Dioxide Emissions	24 MT CO_2-e
Non-Reservoir GHG Emissions	187 MT CO_2-e
Proposal GHG Emissions Intensity	6.24 t CO_2-e/TJ [2,4] 0.41 t CO_2-e/t LNG [3,4]
Net Proposal GHG Emissions Intensity	2.74 t CO_2-e/TJ
Non-Reservoir GHG Emissions Intensity	5.53 t CO_2-e/TJ
Terajoules of gas to be processed at the GGTP	Commercial in confidence
Terajoules of gas to be produced at the GGTP[5]	Commercial in confidence

[1] Time period for 'Remainder of the life of the proposal' represented as FY2023-FY2066. Net emissions estimates have been applied to the whole of FY2023, noting that amended emission reduction targets associated with MS 1198 commenced 22 Oct 2022.

[2] GHG emissions intensity expressed as the total scope 1 GHG emissions (expressed as tonnes of CO_2-e) divided by the terajoules of gas produced from the GGTP (determined in accordance with Item 30(1) of Schedule 2 to the National Greenhouse and Energy Reporting (Safeguard Mechanism) Rule 2015 [Cth]). This calculation method is aligned with condition 27 of MS 800.

[3] GHG emissions intensity expressed as the total scope 1 GHG emissions (expressed as tonnes of CO_2-e) divided by the amount of saleable LNG (expressed as tonnes of LNG). This calculation method is used to calculate the emissions intensity forecast in the Fourth Train Expansion Proposal PER/Draft EIS (Ref. 21).

[4] Emissions intensity value includes emissions associated with processing Domgas and condensate and in providing all associated utilities and support services. Care should be exercised when comparing this metric with similar metrics from other facilities to ensure a like-for-like comparison, particularly noting that emissions may be associated with other co-produced products or from facilities with different reporting boundaries.

[5] Determined in accordance with NGER Item 30(1)

4.3 benchmarking

Benchmarking of the forecast GHG emissions intensity for the GGTP has previously been provided in the assessment documents for the Gorgon Gas Development, including the Fourth Train Expansion Proposal PER/Draft EIS (Ref. 21) and the Draft EIS/ Environmental Review and Management Programme (ERMP) for the Proposed Gorgon Development (Ref. 1).

Table 4-2 compares Proposal GHG emissions and Proposal GHG Emissions Intensity for the GGTP against other comparable projects.

Table 4-2: Benchmarking of Proposal GHG emissions and emissions intensity with comparable facilities

	Gorgon	Wheatstone[1]	Pluto[1]	NWS Extension[1]
Proposal GHG Emissions	211 MT CO_2-e	61 MT CO_2-e	73 MT CO_2-e [2]	385 MT CO_2-e [3]
Proposal GHG Emissions Intensity[4]	0.41 t CO_2-e /t LNG	0.37 t CO_2-e /t LNG[5]	0.37 t CO_2-e /t LNG (Pluto Train 1) 0.33 t CO_2-e /t LNG (Pluto Trains 1 and 2 combined)[6]	0.41 t CO_2-e /t LNG[7]
Net GHG emissions	92 MT CO_2-e	46 MT CO_2-e	53 MT CO_2-e[8]	139 MT CO_2-e[9]
Net GHG emissions intensity	0.17 t CO_2-e /t LNG	0.28 t CO_2-e /t LNG	0.25 t CO_2-e /t LNG[10]	0.15 t CO_2-e /t LNG

[1] Data for Wheatstone, Pluto and NWS Extension does not include emissions from upstream processing associated with gas extraction and offshore processing.

[2] Annual Proposal GHG emissions were obtained from Pluto LNG Facility Greenhouse Gas Abatement Program (Pluto GGAP) (Ref. 22). Total Proposal GHG emissions calculated by applying 1.92 MTPA from July 2022 to December 2025 and 4.1 MTPA from January 2026 to April 2042.

[3] NWS Project Extension Greenhouse Gas Management Plan (Ref. 23) outlines annual proposal GHG emissions of up to 7.7 MTPA CO_2-e (based on an LNG production of 18.5 MTPA). The total Proposal GHG emissions have been based on 50 years of operation at full capacity, noting that the proponent expects the GHG emissions would decline towards the end of project life.

[4] GHG emissions intensity expressed as the total scope 1 GHG emissions (expressed as tonnes of CO_2-e) divided by the amount of saleable LNG (expressed as tonnes of LNG). This calculation method has been used noting that emissions intensity expressed as the total scope 1 GHG emissions divided by the terajoules of gas produced was not available for other projects. Care should be exercised when comparing this metric with similar metrics from other facilities to ensure a like-for-like comparison, particularly noting that data provided also include emissions associated with other co-produced products such as DomGas, liquefied petroleum gas (LPG) and condensate and the different scope of the facility emissions, per note 1.

[5] Draft EIS/ERMP for the Proposed Wheatstone Project (Ref. 24), submitted to the EPA in 2010 and approved by way of MS 873 in 2011 (Ref. 25), forecast a GHG emissions intensity for the Wheatstone Project of 0.37 t CO_2-e/t LNG.

[6] Pluto GGAP (Ref. 22) states 'based on pre-operational estimates, the Pluto LNG Facility's GHG emissions intensity was forecast to be approximately 0.37 t CO_2-e/t LNG' and 'post commissioning of Pluto Train 2, the combined Pluto LNG Facility intensity in steady-state operations is estimated to be 0.33 t CO_2-e/t LNG.' Actual GHG emissions intensities for the existing Pluto facility (post commissioning) have ranged from 0.36 in FY2020 to 0.45 in FY2014.

[7] Northwest Shelf Project Extension Proposal Appendix F Greenhouse Gas Benchmarking (Ref. 26) outlines a typical Proposal GHG emissions intensity (for Karratha Gas Plant only) of 0.41 t CO_2-e/t LNG over FY2015-2018.

[8] Net emissions over July 2022 to April 2042 period, applying interim and long-term targets outlined in the Pluto GGAP (Ref. 22).

[9] Sourced from EPA Report 1727 North West Shelf Project Extension Proposal (Ref. 27). Based on 50-year life 2020-2070).

[10] Net GHG emissions divided by tonnes of LNG (calculated by applying 4.9 MTPA FY2023-2025 and 12 MTPA for 2026 to April 2042).

4.4 historical GHG emissions profile

The historical GHG profile for the GGTP is shown in Figure 4-1 and Table 4-3. There are no Scope 2 emissions associated with the GGTP; all emissions shown below are Scope 1 emissions. The emissions profile in FY2016 and FY2017 reflects commissioning activities, rather than stable operations, which is evidenced by elevated flaring emissions. During FY2018 and FY2019 there were

elevated emissions from the AGRUs. During pre-commissioning and start-up safety checks, technical issues associated with the Carbon Dioxide Injection Project were identified. These technical issues created a potential risk to the safety of the CO_2 pipeline over the life of the Gorgon Gas Development, due to potential corrosion impacts to the pipeline in transient conditions. These technical issues were addressed successfully, and the safe start-up and operation of the carbon dioxide injection system commenced on 6 August 2019. As a result, the emissions from the AGRUs were significantly reduced in FY2020 and FY2021. The primary source of GHG emissions during FY2020 and FY2021 was combustion of fuel gas in the gas turbines, which drive refrigerant compressors used for LNG liquefaction. In FY2022 the GGTP had reliable high production without any turnaround events, resulting in increased fuel gas usage. This was coupled with a limitation on the rate of CO_2 injection for the full period, which also resulted in a significant increase in emissions from the AGRUs.

The CO_2 content of the reservoir gas entering the GGTP is shown in the Acid Gas Removal (Reservoir CO_2) and CO_2 Captured categories in Figure 4-1 and Table 4-3. The CO_2 concentration of the feed gas has averaged ~7 mol% since operations started.

GHG emissions from the GGTP contribute ~6.3% of WA's overall GHG emissions, based on 2020 data[1].

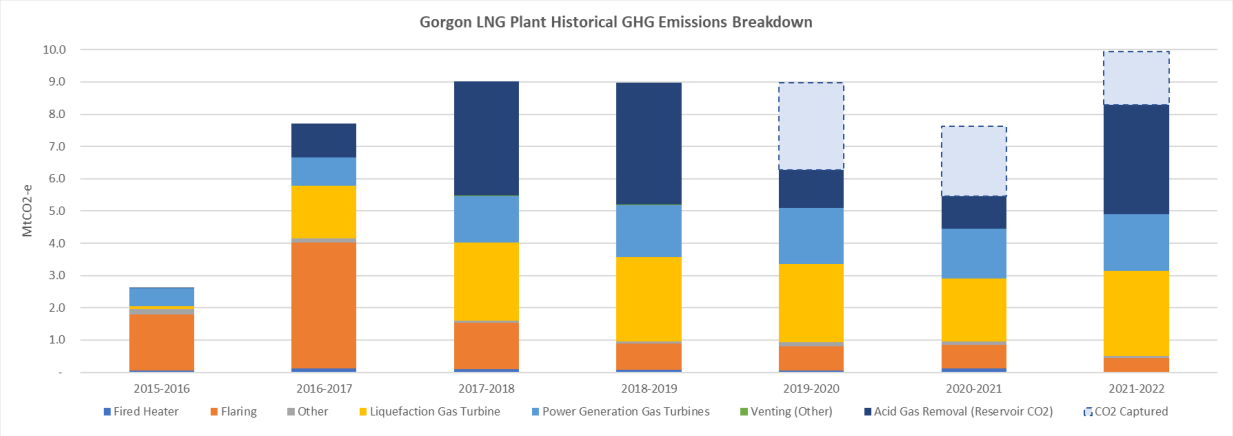


Figure 4-1: GGTP historical GHG emissions (MT CO_2-e) by source

Table 4-3: GGTP historical GHG emissions (MT CO_2-e) by source

	FY2016	FY2017	FY2018	FY2019	FY2020	FY2021	FY2022
Fired Heaters	0.05	0.12	0.10	0.07	0.06	0.11	0.02
Flaring	1.73	3.91	1.44	0.83	0.74	0.74	0.43
Liquefaction Gas Turbines	0.09	1.64	2.44	2.61	2.43	1.96	2.63
Power Generation Gas Turbines	0.56	0.89	1.43	1.62	1.73	1.53	1.75
Other Sources	0.17	0.12	0.05	0.05	0.13	0.10	0.06

[1] State and Territory Greenhouse Gas Inventories 2020. Retrieved from https://www.dcceew.gov.au/climate-change/publications/national-greenhouse-accounts-2020

	FY2016	FY2017	FY2018	FY2019	FY2020	FY2021	FY2022
Venting (Other)	0.00	0.00	0.02	0.02	0.00	0.00	0.00
Acid Gas Removal (Reservoir CO_2)	0.01	1.05	3.55	3.76	1.18	1.02	3.40
TOTAL	2.61	7.72	9.02	8.97	6.26	5.46	8.32
Reservoir CO_2 Captured					2.71	2.17	1.65

Table 4-4 provides actual GHG emission intensities based on operational data through to end of FY2022. From FY2016 to FY2020, the average GHG emissions intensity decreased in line with the GGTP moving from commissioning into operations. The FY2021 reporting period was impacted by lower Reservoir CO_2 injection than planned, and additional unplanned outages (turnarounds). The most recent reporting period, FY2022, had increased production, resulting in increased fuel gas usage, in addition to lower Reservoir CO_2 injection than planned. As a result, emissions intensities in FY2021 and FY2022 increased from the level achieved in FY2020.

Table 4-4: GGTP historical GHG emissions intensities

	FY2016	FY2017	FY2018	FY2019	FY2020	FY2021	FY2022
Proposal GHG Emissions Intensity (t CO_2-e/TJ)[1,3]	358.5	18.4	10.3	9.4	7.1	7.4	8.0
Proposal Non-reservoir GHG Emissions Intensity (t CO_2-e/TJ)[1,3]	357.7	15.8	6.2	5.4	5.7	6.0	4.7
Proposal GHG Emissions Intensity (t CO_2-e/t LNG)[2,3]	19.61	1.13	0.63	0.57	0.43	0.47	0.50
Net Proposal GHG Emissions Intensity (t CO_2-e/TJ)	357.9	16.4	7.1	6.2	6.6	6.9	5.7

[1] GHG emissions intensity expressed as the total scope 1 GHG emissions (expressed as tonnes of CO2-e) divided by the terajoules of gas produced from the GGTP (determined in accordance with Item 30(1) of Schedule 2 to the National Greenhouse and Energy Reporting (Safeguard Mechanism) Rule 2015 [Cth]). This calculation method is aligned with condition 27 of MS 800.

[2] GHG emissions intensity expressed as the total scope 1 GHG emissions (expressed as tonnes of CO2-e) divided by the amount of saleable LNG (expressed as tonnes of LNG). This calculation method is used to calculate the emissions intensity forecast in the Fourth Train Expansion Proposal PER/Draft EIS (Ref. 21).

[3] Emissions intensity value includes emissions associated with processing Domgas and condensate and in providing all associated utilities and support services. Care should be exercised when comparing this metric with similar metrics from other facilities to ensure a like-for-like comparison.

4.5 emissions reduction targets for the GGTP

In accordance with condition 27.1 of MS 800, CAPL will take measures to reduce Net GHG Emissions from the GGTP such that Net GHG Emissions do not exceed:

a) 5,220,000 t CO_2-e / year for the period until 30 June 2030;

b) 4,250,000 t CO_2-e / year for the period between 1 July 2030 and 30 June 2035;

c) 3,220,000 t CO_2-e / year for the period between 1 July 2035 and 30 June 2040;

d) 2,120,000 t CO_2-e / year for the period between 1 July 2040 and 30 June 2045;

e) 1,090,000 t CO_2-e / year for the period between 1 July 2045 and 30 June 2050; and in any event; and

f) zero t CO_2-e / year for every five-year period from 1 July 2050 onwards.

Figure 4-2 depicts these Net GHG Emissions targets and the percent reduction in emissions from the GGTP GHG Baseline.

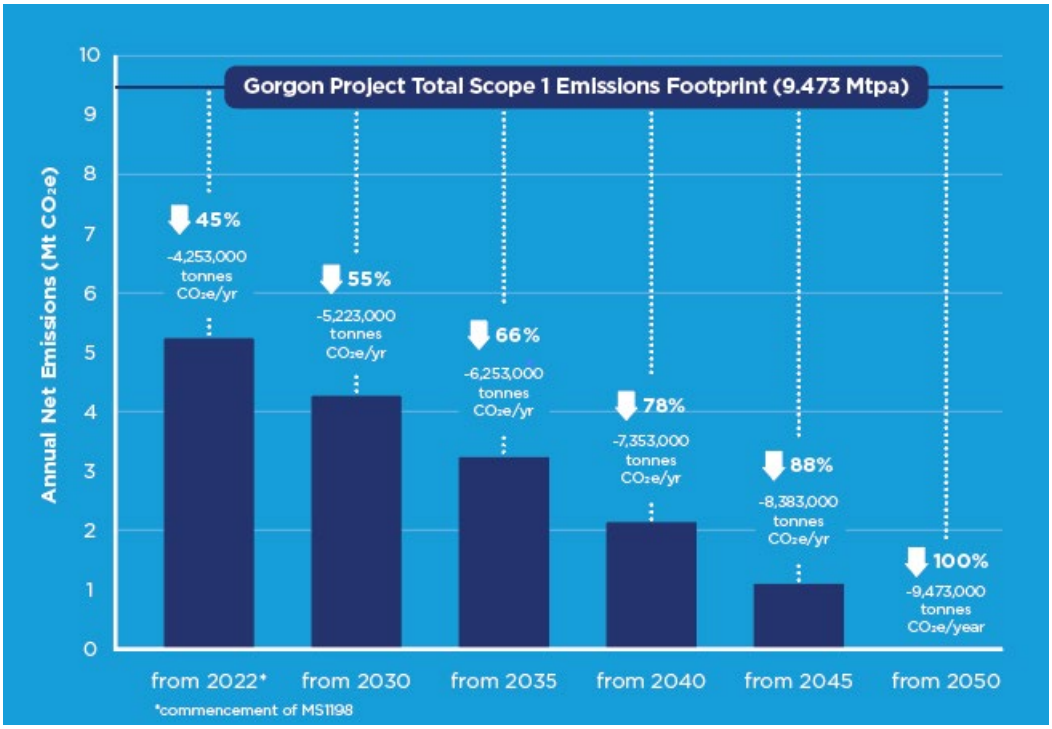


Figure 4-2: Net GHG emissions targets (per condition 27.1 of MS 800) and associated percent reduction in emissions from GGTP baseline

Information on the potential mitigation actions proposed for 2025–2035 are set out in Section 5. Beyond 2035 there is greater uncertainty on the level of emissions reductions that may be achieved owing to a number of factors such as outcomes of GHG optimisation projects, realisation of technological advancements and availability of offsets. Information on the potential mitigation actions proposed for the post-2035 period will be outlined in future updates of this Plan and will reflect strategies and measures reasonably practicable at the time, noting the expectation that potential mitigations will develop over time and more effective mitigation alternatives may become available.

5 GHG mitigation actions in design

5.1 philosophy

GHG emissions minimisation was integrated into the design basis of the Gorgon Gas Development and considered within the emissions estimate included within the Gorgon Gas Development Draft EIS/ERMP (Ref. 1). This GHGMP can be distinguished from recent Plans provided by other proponents as both the design mitigation selection process and subsequent construction of the facility is complete. The following sections describe the facilities and practices that were adopted to avoid and reduce emissions through best practice design and the mitigations that were considered during the design phase but not adopted.

5.2 adopted design mitigations

5.2.1 carbon dioxide injection system

Injecting Reservoir CO_2 recovered from the AGRUs into a confined subsurface reservoir (Dupuy Formation) below Barrow Island. Reservoir CO_2 is intended 21eservevented only in the event of injection system maintenance or unplanned downtime, or in the event of an unforeseen reservoir performance or injection or pressure management well constraint.

5.2.2 no routine flaring of hydrocarbons

A no routine flaring of hydrocarbons policy has been adopted. Routine flaring is defined as the continuous flaring of process hydrocarbon gas beyond that required for the safe operation of the flare system (i.e. flare pilots and purge gas) and plant (e.g. small flows from equipment purges which are not practicable to collect during normal production operations).

5.2.3 no routine venting of hydrocarbons

A no routine venting of hydrocarbons policy has been adopted. Minor quantities of hydrocarbons may be vented under non-routine operating conditions such as prior to maintenance activities, process or equipment trips, or where not practicable to collect during normal production operations..

5.2.4 use of nitrogen rejection unit end flash gas

Using the end flash gas from the nitrogen rejection unit as fuel gas. Prior to use as fuel, the low temperatures in this gas (−160 °C) are used to cool mixed refrigerant and reinjection liquefied petroleum gas (LPG) components, thus recovering ‘cold energy’ from this stream. This reduces the amount of power required to produce a unit of LNG, thereby reducing overall GHG emissions from the mechanical drive turbines by an equivalent amount for a given amount of LNG production.

5.2.5 tandem dry gas seals

Using tandem dry gas seals for process compressors in the plant, and on smaller compressors in minor service, where appropriate.

5.2.6 site selection

The selection of Barrow Island as the preferred site for the GGTP enabled the use of subsea technology rather than platform-based offshore gas processing. Eliminating the need for an offshore gas production and compression platform and

using a subsea gas production system, achieved a significant reduction in overall GHG emissions.

5.2.7 waste heat recovery system

Using a waste heat recovery system on the refrigeration compressor GTs to recover thermal energy from the GT exhaust gases, significantly reducing the need to use heaters/boilers to meet process heat demand during routine production operations.

5.2.8 activated MDEA

Using activated MDEA (a-MDEA) as the preferred amine for acid gas removal from the feed gas. Activated MDEA uses significantly less energy for CO_2 removal than competing amines such as mono-ethanol amine (MEA) or di-ethanol amine (DEA). The use of a-MDEA means that electrical energy is saved from a smaller circulation rate, as well as thermal energy from a lower heat of desorption and less circulation.

5.2.9 liquefaction process

Selecting the Air Products and Chemicals Incorporated (APCI) Split–MR™ Propane Pre-Cooled Mixed Refrigerant (MR) Process as the liquefaction process to produce LNG. This best-in-class process, first employed at the RasGas LNG Plant in 2003, uses all available power from two primary drivers by splitting the MR compression duty onto the two drivers. This provides the optimal refrigeration split and achieves a best-in-class process efficiency and decreased GHG intensity.

5.2.10 use of LNG and MR expanders

Using LNG and MR expanders to produce an isentropic pressure drop for the LNG and refrigerant fluids, thus reducing the amount of lost work in the process relative to using an expansion valve. The expanders also convert energy contained in the process stream that would otherwise be lost, into electricity. This reduces the amount of power required to produce a unit of LNG thereby reducing overall GHG emissions from the mechanical drive turbines by an equivalent amount for the same amount of LNG production.

5.2.11 recovery of flash gas from nitrogen rejection system

Using a recycle compressor to recover flash gas from the nitrogen rejection system and recycle it to the feed gas. Most plants recover this flash vapour to the low-pressure fuel system. Since the flash gas is CO_2-rich, fuel gas consumers using this fuel gas source emit more CO_2 than those using normal plant fuel gas. Therefore, the Gorgon Gas Development use of the flash gas recycle compressor and plant configuration provides a significant reduction in GHG emissions.

5.2.12 recovery of LNG BOG from ship loading

Recovering and re-using LNG BOG generated during ship loading operations by compressing it to the front end of the GTP via a BOG recycle compressor.

5.2.13 recovery of LNG BOG from LNG storage tanks

Recovering BOG from the LNG storage tanks during normal LNG holding mode by using redundant BOG compressors. This gas is sent to fuel, where it displaces

an equivalent amount of fuel that would otherwise be sourced from the feed gas. The BOG recycle compressor provides sparing for the BOG compressor when not engaged in LNG loading operations (i.e. in LNG holding mode only). This reduces the potential for flaring in the event that the BOG compressor fails during normal LNG holding mode.

5.2.14 LNG loading lines thermal status

Under normal operations, maintaining the LNG loading lines in a cold state between LNG carrier loadings. While this strategy increases the overall heat leak into the LNG lines, it decreases the amount of vapour generated during loading operations, which would otherwise require flaring during peak cool-down operations or a slow and inefficient loading operation. Either of these options would result in an increase in GHG emissions.

5.2.15 recovery of vapour from refrigerant storage vessels

Sending any vapour generated in the refrigerant storage vessels to a LNG storage tank rather than directing it to flare.

5.2.16 adjustable speed drives to selected motors

Fitting adjustable speed drives to selected motors such as the End Flash Gas Compressors and CO_2 Injection Compressors. This will allow motor duty to be matched to the process requirements without wasting energy.

5.2.17 low fugitive emission type control valves

Specifying control valves as low fugitive emission type, with a maximum allowable process fluid leakage. Since control valve leaks are responsible for the majority of fugitive process fluid emissions in the plant, and the GGTP process emissions are largely methane, this is expected to provide a significant reduction in GHG emissions in the order of several thousand tonnes of methane annually.

5.2.18 tube leak recovery from Main Cryogenic Heat Exchanger (MCHE)

Installing a pressure-controlled line from the MCHE shell side to the End Flash Gas Compressor suction so that tube leaks in the MCHE will first be routed to fuel gas usage instead of being flared. However, if the pressure continues to increase, the gas is routed to the flare.

5.3 other abatement options considered

Table 5-1 summarises several technology options considered during the preliminary design phase of the Gorgon Gas Development that had the potential to further reduce GHG emissions but which were not adopted. As was the case for all GHG emissions abatement options considered, these options were assessed on a combination of cost effectiveness, operability, technology, health, safety and environmental risks. The key factors for not selecting these options are included in the Table.

Table 5-1: Other GHG emissions abatement options considered during design phase

Design Option	Offset in GHG Emissions ($t CO_2$-e pa)	Evaluation Comments
Use of alternative LNG technology rather than APCI	100,000	Emissions improvement was only a claim as the alternative technology remained unproven at the time. Significant operability, asset, and health, environment, and safety (HES) risk with being the first application of this new technology at the time
Electric drive LNG compressors rather than direct drive compressors	300,000	Use of electric drive LNG compressors was relatively untested and carried higher technology risks and increased plot space requirements.
Combined cycle electrical power generation	900,000	Combined cycle power generation would increase operating cost, complexity and required plot space and potentially reduce plant reliability. Lack of readily available water supply on Barrow Island.
Aero-derivative gas turbines for electrical power generation	280,000	Increased operating costs and larger plot space requirements
Power recovery turbines on liquid stream pressure let downs	Small	Rejected due to cost and operational complexity.
Air insulation on high voltage equipment	Small	Rejected due to increase in plot space required over gas-insulated switch gear.

6 GHG mitigation actions in operation

Following on from the design stage, CAPL recognises the importance of innovation and continuing to apply mitigations through the subsequent steps of the mitigation hierarchy as critical to the success of achieving its interim and long-term emissions reduction targets. This includes continuous improvement to reduce emissions over the life of the project through Chevron's CO_2 Injection System and GHG Optimisation Process and by offsetting emissions through the implementation of a GHG emissions offset package.

The following section describes the processes, facility modifications and subsequently offsets program which have been and continue to be applied during the operational phase of the project consistent with the greenhouse gas mitigation hierarchy.

6.1 carbon dioxide injection system

Carbon capture and storage (CCS) is a proven technology for reducing GHG emissions. It takes carbon dioxide from industrial processes and permanently stores it in geological formations deep underground. Chevron considers that CCS is critical to a lower-carbon future and essential to achieving the net zero goals of the Paris Agreement.

The Gorgon Carbon Dioxide Injection System is currently the largest CCS Project of its kind in the world and represents one of the largest GHG abatement projects undertaken by industry to date. To date, the Gorgon Joint Venture Participants have invested more than AU$3 billion in the Carbon Dioxide Injection System and remain committed to improving the performance of the system over the life of the Development. The safe start-up and operation of the Gorgon Carbon Dioxide Injection System commenced on 6 August 2019. Since the commencement of injection approximately 6 million tonnes of GHG have been injected.

The Gorgon Carbon Dioxide Injection System is operated in accordance with the Gorgon Project Carbon Dioxide Disposal Management Plan (Ref. 28), required in accordance with Section 13 of the *Barrow Island Act 2003* (WA). The rate at which Reservoir CO_2 is injected is impacted by subsurface uncertainties including the ability to manage pressure build-up in the target carbon dioxide injection formation, the Dupuy formation.

To improve CO_2 injection rates, CAPL will continue to investigate opportunities to improve existing pressure management operations, which have encountered limitations in achieving the necessary pressure relief. In addition, the pressure management scope may be further expanded in the future to ensure the CO_2 injection system continues to be optimised.

The Gorgon Carbon Dioxide Injection System is an integral part of the Gorgon Gas Development's emissions reduction strategy. The Gorgon Joint Venture participants remain committed to safely injecting as much CO_2 as practicable over the life of the Gorgon Development.

6.2 GHG optimisation process

To help lower carbon intensity cost efficiently, Chevron uses a lower carbon portfolio optimisation process. This process uses the Marginal Abatement Cost Curve (MACC) tool to identify, prioritise and fund opportunities to reduce GHG emissions that enable Chevron to make progress towards its GHG reduction targets.

The MACC tool is used to visualise a portfolio of carbon reduction opportunities by cost and by magnitude of emission reductions, which enables an asset or business unit to prioritise the most cost-efficient reductions. At Chevron, MACC also refers to the internal enterprise process for optimised selection of the most efficient carbon reduction projects for corporate funding. Funding for carbon reduction projects is allocated to the business units during the annual business planning process, with the aim of supporting projects that most cost efficiently reduce carbon intensity across the enterprise.

A high-level overview of the GHG optimisation process is outlined in Figure 6-1. The initial phase includes routine assessments where subject matter experts (SMEs) identify potential abatement opportunities and quantify potential emissions reductions. Abatement opportunities that are technically feasible then undergo further assessment and screening to enable development of a qualitative MACC. The MACC is then used to recommend opportunities that should be further progressed and eventually operationalised.

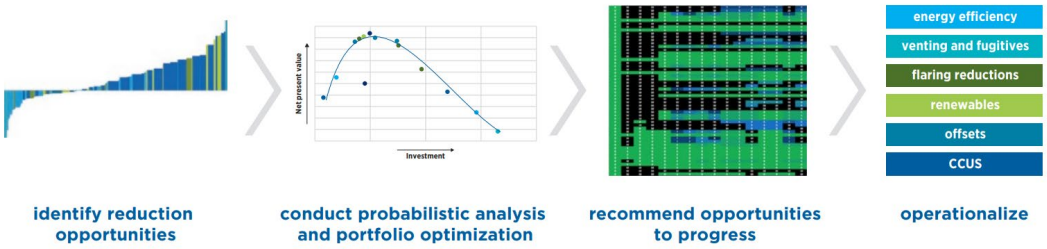


Figure 6-1: Chevron GHG optimisation process

CAPL has already started implementing this GHG optimisation process for the Gorgon Gas Development. In 2021, infrastructure was retrofitted to the LNG trains to route monoethylene glycol (MEG) flash gas vapours to the GTP inlet facilities, for treatment and processing via the mercury removal units, AGRUs, and sequestration of captured CO_2 such that there is no routine flaring or venting of MEG flash gas vapours during normal operations.

Other GHG optimisation activities implemented at the GGTP include:

- GT performance improvement – Performance improvement packages (PIPs) were installed on the GTs within the LNG trains during their respective turnarounds from 2019 to 2021. The PIP improves the engine efficiency by reducing losses across seals, improving aero performance, and increasing the firing temperature, reducing the carbon intensity of production.
- Advanced Process Control (APC) systems – APC systems control processes at the LNG facility more precisely, resulting in energy efficiency gains. APC systems use computer algorithms to make incremental changes that allow facilities to operate closer to their design limits and increase performance, thus helping reduce energy use. APC systems installed on portions of the LNG facility have improved process stability and reduced flaring.
- Implementation of a revised warm restart MCHE cooldown procedure, which eliminates the pre-cooldown step from the start-up sequence, resulting in reduced flaring and more consistent start-ups.
- Roll out of mobile solar lighting towers in place of traditional diesel-powered mobile lighting tower units avoiding corresponding emissions from the diesel

units. Mobile lighting towers allow the safe completion of critical night works on Barrow Island; about 50 towers are typically used on a nightly basis.

Further technical assessment for early-phase alternatives identified through the MACC process which have the potential for reduction of scope 1 greenhouse gas emissions from the liquefaction and power generation gas turbines is underway. These alternatives include but are not limited to post-combustion carbon capture, pre-combustion carbon capture and electrification. The greenhouse gas mitigation hierarchy will be applied in consideration of progressing any potential selected alternative.

6.3 offsets

Offsets will complement other efforts to reduce Gorgon's GHG emissions. Where sufficient emissions avoidance and/or reductions to reach the targets outlined in Section 4.5cannot be achieved through operational measures or emission reduction projects, the shortfall will be offset.

Offset will involve the acquisition and surrender of carbon offsets that meet integrity principles and are based on clear, enforceable and accountable methods. In accordance with MS 800, Authorised Offsets are:

(a) Australian Carbon Credit Units (ACCUs) issued under the *Carbon Credits (Carbon Farming Initiative) Act 2011* (Cth);

(b) Verified Emission Reductions (VERs) issued under the Gold Standard program;

(c) Verified Carbon Units (VCUs) issued under the Verified Carbon Standard program; or

(d) other offset units that the Minister has notified in writing meet integrity principles and are based on clear, enforceable and accountable methods.

This diversity in offset types is an important means of managing the risks associated with obtaining sufficient volumes, given the varied and dynamic nature of current offset markets.

Where required, offsets will be surrendered expressly for the purposes of net emissions reduction at Gorgon. Net emissions are considered the total scope 1 emissions less any carbon offsets acquired and surrendered in respect of Gorgon Gas Development emissions, including but not limited to those surrendered in respect of obligations under the SGM or other Australian legislative obligations. In this regard, Chevron notes the establishment of Safeguard Mechanism Credits (SMC) following the passing of the *Safeguard Mechanism (Crediting) Amendment Bill 2023*.

Reconciliation of any emissions reduction shortfall and the volume of surrendered offsets will occur on a five-yearly basis, aligned with the target periods, and will be reported to the WA Department of Water and Environmental Regulation (DWER) at the end of each period.

Chevron has been active in offset procurement globally for nearly two decades and across multiple jurisdictions and will leverage this capability to address any offset requirements for the GGTP. Chevron has a business unit, Chevron New Energies, which is focused on developing scalable, low-carbon business opportunities, including offset project opportunities, around the world.

7 monitoring and reporting

Monitoring, auditing and public reporting of GHG emissions from the Gorgon Operations Facility is carried out in accordance with the requirements of the NGER Act, or as otherwise required by law. The GHG emissions from the GGTP are a subset of those from the Gorgon Operations Facility, as such the same monitoring, auditing and reporting processes will apply, including public reporting of GHG emissions on an annual basis.

In addition, monitoring, auditing and public reporting of GHG emissions from the GGTP will be carried out in accordance with MS 800 (as amended by MS1198), including:

- annual reporting per condition 27.2; and
- five-yearly reporting per condition 27.3.

A summary document comprising of a summary plan and progress statement outlining key information from the GHGMP (and reports to that time) will be submitted to the Chief Executive Office of DWER and published on CAPL's website each time a revised GHGMP is submitted to the DWER. The summary document will provide information, per condition 27.5, in an accessible form, which can be easily reviewed by third parties for transparency.

In addition, annual compliance reporting will be undertaken in accordance with condition 4 of MS 800.

8 stakeholder consultation

CAPL has undertaken regular consultation with stakeholders throughout the development of the environmental impact assessment management documentation for the Gorgon Gas Development. This stakeholder consultation included engagement with the community, government departments, industry operators, and contractors to CAPL via planning workshops, risk assessments, meetings, teleconferences, and the EIS/ERMP formal approval processes.

A draft version of this Plan was submitted to DWER on 5 April 2022 and 17 August 2022 to inform the section 46 inquiry into amending the implementation conditions of MS 769 (for the Jansz Feed Gas Pipeline: Barrow Island Nature Reserve), MS 800 as amended by MS 865 and MS 1136 (for the Gorgon Gas Development Revised and Expanded Proposal: Barrow Island Nature Reserve) and MS 1002 (for the Gorgon Gas Development Fourth Train Expansion Proposal) relating to the emission of GHGs.

In accordance with condition 27.8 of MS 800, the approved GGTP GHGMP and associated reports (including summary plans and progress statements) will be made publicly available on CAPL's website.

9 adaptive management and plan revision

CAPL is committed to conducting activities in an environmentally responsible manner and aims to implement reviews of its environmental management actions as part of a program of continuous improvement. This commitment to continuous improvement means that CAPL will apply an adaptive management approach by routinely monitoring matters such as GHG emissions, GHG emission intensity, technological developments, operational processes, availability of offsets, changes in environmental risks, and changes in business conditions to determine the need for adjustments to management measures, monitoring, and update of this Plan.

Future updates to this Plan will aim to identify and describe potential technology and operational processes that may or could be implemented to avoid, reduce and/or offset Proposal GHG Emissions, Reservoir Carbon Dioxide or Non-Reservoir GHG Emissions, and/or reduce Proposal GHG Emissions Intensity.

In addition to any updates as a result of adaptive management reviews, outlined above, this Plan will be reviewed and updated every five years as a minimum or as required by condition 27.6 of MS 800. With any revision to this Plan, a summary of the Plan will also be prepared, which includes a summary of the matters listed in condition 27.7 of MS 800.

As outlined in Section 4.5, information on the potential mitigation actions proposed to achieve the long-term emission reduction targets will be outlined in future updates of this Plan and will reflect strategies and measures reasonably practicable at the time, noting the expectation that potential mitigations will develop over time and more effective mitigation alternatives may become available.

10 acronyms, abbreviations and definitions

Table 10-1 defines the acronyms and abbreviations used in this document.

Table 10-1: Acronyms, abbreviations and definitions

Acronym/ Abbreviation	Definition
~	Approximately
°C	Degrees Celsius
ABU	Australasian Business Unit
ACCU	Australian Carbon Credit Unit
AGRU	Acid Gas Removal Unit
APC	Advanced Process Control
APCI	Air Products and Chemicals Incorporated
BOG	Boil Off Gas
CAPL	Chevron Australia Pty Ltd
CCS	Carbon Capture Storage
CER	Clean Energy Regulator
Chevron	Chevron Corporation
CO_2	Carbon dioxide
CO_2-e	Carbon dioxide equivalent
DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water
DEA	Di-ethanol Amine
DISER	Department of Industry, Science, Energy and Resources
Domgas	Domestic Gas
DWER	Western Australian Department of Water and Environmental Regulation
EIS	Environmental Impact Statement
EP Act	Western Australian *Environmental Protection Act 1986*
EPA	Western Australian Environmental Protection Authority
EPBC	Environment Protection and Biodiversity Conservation
ERF	Emissions Reduction Fund
ERMP	Environmental Review and Management Programme
FY	Financial Year
GGAP	[Pluto] Greenhouse Gas Abatement Program
GGTP	Gorgon Gas Treatment Plant
GHG	Greenhouse Gas
GHGMP	Greenhouse Gas Management Plan
GJV	Gorgon Joint Venture / Venturers
GT	Gas Turbine
GTG	Gas Turbine Generator
GTP	Gas Treatment Plant

Acronym/ Abbreviation	Definition
GWP	Global Warming Potential
ha	Hectare
km	Kilometre
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
MACC	Marginal Abatement Cost Curve
MCHE	Main Cryogenic Heat Exchanger
MDEA	Methyl di-ethanol amine
MEA	Mono-ethanol Amine
MEG	Monoethylene glycol
mol%	Mole percent
MR	Mixed Refrigerant
MS	Ministerial Statement
MTPA	Million tonnes per annum
MW	Megawatt
NGER	National Greenhouse Energy Reporting
NGER Act	Commonwealth *National Greenhouse and Energy Reporting Act 2007*
Non-Reservoir GHG Emissions	Proposal emissions other than Reservoir Carbon Dioxide which have not been injected underground
Non-Reservoir GHG Emissions Intensity	Non-Reservoir GHG Emissions per terajoule of gas produced from the proposal facility determined in accordance with NGER Item 30(1)
PER	Public Environmental Review
PIP	Performance Improvement Package
Proposal	Gorgon Gas Development, as expanded and revised by the Revised and Expanded Gorgon Gas Development
Proposal GHG Emissions	Scope 1 GHG Emissions released to the atmosphere as a direct result of an activity or series of activities that comprise/s or form/s part of the proposal, calculated in accordance with: (a) the *National Greenhouse and Energy Reporting Act 2007* (Cth) and its subsidiary legislation; or (b) if that Act or the relevant subsidiary legislation is amended or repealed such that it does not provide a mechanism for calculating the Proposal Emissions, any other Act, regulation or instrument concerning greenhouse gases as specified by the CEO
Proposal GHG Emissions Intensity	Proposal GHG Emissions per terajoule of gas produced from the proposal facility determined in accordance with NGER Item 30(1)
Reservoir Carbon Dioxide	GHG emissions that are separated (from natural gas or the products produced from extracted hydrocarbons) in the acid gas removal units and expected to be subsequently injected underground (as per MS 1198)
Scope 1 GHG emissions	GHG emissions released to the atmosphere as a direct result of an activity, or a series of activities at a facility level
Scope 2 GHG emissions	Indirect GHG emissions from the consumption of an energy product

Acronym/ Abbreviation	Definition
Scope 3 GHG emissions	Indirect GHG emissions other than Scope 2 emissions that are generated in the wider community. Scope 3 emissions occur as a consequence of the activities of a facility, but from sources not owned or controlled by that facility's business.
SGM	Safeguard Mechanism
SMC	Safeguard Mechanism Credit units
t	Tonne
TJ	Terajoule
t CO_2-e	Tonnes of carbon dioxide equivalent
VCU	Verified Carbon Unit
VER	Verified Emission Reduction
WA	Western Australia

11 references

The following documentation is either directly referenced in this document or is a recommended source of background information.

Table 11-1: References

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Appendix A scope 3 emissions estimate

Estimates of scope 3 GHG emissions associated with the Gorgon Gas Development have previously been provided in the assessment documents for the Gorgon Gas Development, including the Fourth Train Expansion Proposal PER/Draft EIS (Ref. 21) and the Draft EIS/ERMP for the Proposed Gorgon Development (Ref. 1).

Applying contemporary guidance on estimating emissions, the current estimate of Gorgon scope 3 GHG emissions associated with transport and third-party end use of products is 49.8 MTPA CO_2-e.

For the purposes of estimating scope 3 GHG emissions the following key documents and inputs were used:

- emissions factors sourced from IMO Resolution MEPC.245(66) (Ref. 29) and IPCC AR5 100-year global warming potentials (GWP);
- emissions from third-party use of products were calculated in alignment with methods in Category 11 of IPIECA's Estimating Petroleum Industry Value Chain (Scope 3) Greenhouse Gas Emissions, including product quantity and fuel-specific higher heating values, and the CO_2, CH_4 and N_2O combustion emissions factors for each fuel type (Ref. 30);
- evaluation based upon production data from a representative year (15.6 MT net LNG), applying API compendium methodologies and factors (Ref. 31; Ref. 32), and IPCC AR5 100-year GWP;
- transport emissions estimated from shipping fuel consumption scaled for a representative year of production.