



Plan

Greenhouse Gas Management Plan

PEG Power Station

May 2020

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Greenhouse Gas Management Plan			
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1. INTRODUCTION

1.1 Description of Project

Pilbara Energy Generation Pty Ltd (PEG), a wholly owned subsidiary of Fortescue Metals Group (Fortescue) is developing the Pilbara Energy Generation Program (PEG Program) which consists of a combination of interconnected solar and gas-fired power generation across several locations in the Pilbara Region of Western Australia. The Program involves the development of two solar farms, with a combined capacity of approximately 150 MW, in addition to the proposed 165 MW PEG Power Station Project, which is the subject of this Greenhouse Gas Management Plan. The energy generated by the PEG Program will be used to provide power to a range of Fortescue and Fortescue Joint Venture projects across the Pilbara.

The PEG Power Station is located adjacent to the existing Solomon Power Station at the Solomon Iron Ore Mine and will involve the construction of 14 new gas-fired reciprocating engines with a combined maximum installed capacity of 165 MW. It is expected that the average export from the facility will be approximately 150 MWe. The PEG Power Station will replace the need to construct the approved power station at North Star Mine.

The PEG Power Station is expected to produce approximately 1,314,000 MWh of electricity per annum, with greenhouse gas emissions of 609,696 tCO₂-e per annum. Natural gas for the PEG Power Station will be delivered via the existing Fortescue River Gas Pipeline.

1.2 Requirement for Management Plan

The Greenhouse Gas Environmental Management Plan (the Plan) has been prepared for submission with the referral of the PEG Power Station to the Western Australian Environmental Protection Authority (EPA).

In the desired scenario where assessment and regulation of the PEG Power Station is deferred to PtV of the EP Act, it is assumed that this management plan will be required under a future prescribed premise licence.

1.3 Objective and Scope

This Plan addresses the EPA's requirements described in the *Environmental Factor Guideline: Greenhouse Gas Emissions* (April 2020), that a proponent demonstrates their contribution towards the aspiration of net zero emissions by 2050, in relation to the Scope 1 GHG emissions of the PEG Power Station.

The objective of this Plan is to demonstrate:

- The intended reduction in Scope 1 emissions of the PEG Power Station,
- The interim and long-term targets that reflect an incremental reduction in Scope 1 emissions of the PEG Power Station,

- That all reasonable and practicable measures have been applied to avoid, reduce and offset the PEG Power Station's Scope 1 GHG emissions.

1.4 Legislation and Regulatory Framework

Fortescue employees and contractors are obliged to comply with all relevant State and Commonwealth legislation. Legislation directly relevant to the management of GHG emissions in Western Australia is provided in the following table.

Table 1 - Applicable legislation and regulatory framework for GHG emissions management

Legislation	Application
<i>Environmental Protection Act 1986 (WA)</i>	State environmental impact assessment and Ministerial approval process.
<i>National Greenhouse and Energy Reporting Act 2007 (Cwth)</i>	National framework for reporting greenhouse gas emissions, greenhouse gas projects and energy consumption and production by Corporations in Australia.
<i>National Greenhouse and Energy Reporting (Safeguard Mechanism) Rule 2015 (Cwth)</i>	Compliance rules and procedures for administering the safeguard mechanism, which applied to facilities with Scope 1 covered emissions of more than 100,000 tCO ₂ -e per year.
<i>National Greenhouse and Energy Reporting (Measurement) Determination 2008 (Cwth)</i>	Describes the methods, standards and criteria to be applied when estimating greenhouse gas emissions, energy production and consumption.
<i>Environmental Factor Guideline (Greenhouse Gas Emissions) (Environmental Protection Authority, 2020)</i>	Describes how the environmental factor Greenhouse Gas Emissions) is considered by the EPA in the environmental impact assessment process.

1.5 Key Assumptions and Uncertainties

Table 2 - Key assumptions of the Plan

Assumption	Justification / Explanation
The Plan (including GHG emission calculations) is based on an average export of 150MWe.	While the Plan is based on an average electricity output of 150MWe, the installed capacity of the PEG Power Station is 165MW. Actual output may be lower than 150MWe, but not higher.
Greenhouse gas emission estimates are derived from published energy content and emission factors.	GHG emissions have been estimated from energy content and emission factors contained in <i>National Greenhouse and Energy Reporting (Measurement) Determination 2008</i> (2019 version).
The Default Emission Intensity from the Safeguard Mechanism Rule presented in Table 5 is applicable to the PEG Power Station.	Fortescue considers that the Default Emissions Intensity presented in Schedule 2, Part 57 of the <i>National Greenhouse and Energy Reporting (Safeguard Mechanism) Rule 2015</i> apply to the PEG Power Station

Table 3 - Uncertainties associated with the Plan

Uncertainty	Justification / Explanation
Fortescue's product and mine strategy may be amended in the future, resulting in a change to the PEG Power Station GHG emissions.	Fortescue's product and mine strategy is market driven and may result in changes, potentially resulting in higher or lower GHG emissions from the PEG Power Station.
Alternative and/or innovative sources of energy may become available in the future that can avoid or minimise GHG emissions from the PEG Power Station.	Fortescue will investigate relevant alternative and/or innovative energy sources (eg, renewables, hydrogen, etc) when they become viable in the future.

1.6 Rationale of Approach

Benchmarking

Highly efficient gas-fired reciprocating engines will be used at the PEG Power Station, capable of producing a significantly lower emissions intensity than the Default Emission Intensity for Electricity Generation defined in Schedule 2 of the *National Greenhouse and Energy Reporting (Safeguard Mechanism) Rule 2015*.

Table 4 below compares the PEG Power Station with the benchmark identified in the Safeguard Mechanism Rule, as well as the existing gas-fired Solomon Power Station.

Table 4 Emission intensity benchmarks

Default Emission Intensity (<i>Schedule 2, Safeguard Mechanism Rule</i>) tCO ₂ -e/MWh	Nominal PEG Power Station Emission Intensity* tCO ₂ -e/MWh	Comparison – Existing Solomon Power Station 2018-19 tCO ₂ -e/MWh
0.583	0.464	0.628

* Based on heat rate of 9 GJ/MWh and pipeline natural gas emission factor of 51.53 kgCO₂-e/GJ (*National Greenhouse Accounts Factors*, August 2019).

Design

The PEG Power Station has been designed with industry leading and highly efficient gas-fired reciprocating engines to provide energy to a number of Fortescue mines across the Pilbara that could otherwise rely on diesel to produce electricity.

Anticipated as part of the greater PEG Program is the installation of 150 MW of solar PV electrical generation as well as 50MW of battery storage, which will be used in lieu of requiring spinning reserve in the grid to counter issues relating to faults or maintenance with the gas-fired engines.

A new Power Management System will be installed to integrate the PEG Power Station, existing Solomon Power Station and additional anticipated renewable sources (eg, solar, wind) and battery storage, to ensure the most efficient use and dispatch of electricity across the system.

Monitoring and Reporting

Fortescue is required to comply with the requirements of the *National Greenhouse and Energy Reporting Act 2007*, which already requires Fortescue to monitor and report all GHG emissions within the organisation (including from the PEG Power Station). In doing so, the information

captured enables Fortescue to calculate an emissions intensity, which can be compared to benchmark values.

Greenhouse gas emissions generated by the PEG Power Station will be reported to the Clean Energy Regulator annually by 31 October and will be available from the Clean Energy Regulator website.

Where required by a Ministerial Statement or any other regulatory instrument, annual emissions and associated emissions intensity will be reported in the annual report relating to the PEG Power Station.

2. ENVIRONMENTAL MANAGEMENT

2.1 Estimation of Greenhouse Gas Emissions

Greenhouse gas emissions from the PEG Power Station come from the combustion of pipeline natural gas to produce approximately 1,314,000 MWh of electricity from up to 14 gas-fired reciprocating engines, calculated as:

$$150 \text{ MW} \times 24 \text{ hours} \times 365 \text{ days}$$

The estimated annual greenhouse gas emissions from the PEG Power Station are calculated in the table below.

Table 5 - Estimated GHG emissions (Scope 1) from the PEG Power Station

Source of GHG Emission	Estimated Electricity Production per Annum (MWh)	Estimated Emissions Intensity (tCO ₂ -e/MWh)	Estimated GHG Emission per Annum (tCO ₂ -e)
Combustion of pipeline natural gas	1,314,000	0.464	609,696

2.2 Greenhouse Gas Emissions Benchmarking

The PEG Power Station will trigger the requirements of the *National Greenhouse and Energy Reporting (Safeguard Mechanism) Rule 2015* (Safeguard Mechanism) during the first year of operation. The Safeguard Mechanism is triggered when a responsible emitter produces greater than 100,000 tCO₂-e during a financial year.

With forecast GHG emissions greater than 100,000 tCO₂-e during a financial year, Fortescue will apply for a Benchmark-Emissions Baseline under the Safeguard Mechanism based on the following production variable, defined in Schedule 2 of the Safeguard Mechanism:

- Electricity generation

The Benchmark-Emissions Baseline will be supported by a Default Emissions Intensity for electricity generation (currently set at 0.583 tCO₂-e/MWh, benchmarked by Australian Government to industry best-practice). GHG emissions from the PEG Power Station will be benchmarked against the Default Emissions Intensity, and Fortescue will be required to offset any emissions in excess of the Benchmark-Emissions Baseline.

2.3 Design of Project to Minimise Greenhouse Gas Emissions

The following elements of the PEG Power Station have been designed or considered to eliminate or minimise GHG emissions.

2.3.1 Replacement of High-Emission Power Station

The construction of the PEG Power Station will see a net reduction in Scope 1 greenhouse gas emission through the replacement of the approved 221MW North Star Power Station (approved under Ministerial Statement 993). The anticipated greenhouse gas emissions from the North Star Power Station would have been 1,196,426 tCO₂-e per annum.

Greenhouse gas emissions from the PEG Power Station are anticipated to be 606,696 tCO₂-e per annum, representing a reduction of 589,730 tCO₂-e per annum (49% reduction) from the alternative.

2.3.2 Location

The PEG Power Station has been located adjacent to the existing Solomon Power Station and the Fortescue River Gas Pipeline.

The area of land adjacent to the existing Solomon Power Station is already cleared, which avoids the necessity to clear additional vegetation, and the inherent GHG emissions from the activity.

The Fortescue River Gas Pipeline already supplies natural gas to the existing Solomon Power Station and locating the PEG Power Station adjacent to the existing power station avoids the requirement to build additional pipelines, and the inherent GHG emissions from the activity.

2.3.3 Energy Source

Natural gas has a lower emissions intensity than other fossil fuel energy sources (eg, diesel), which minimises the GHG emissions produced by the power station.

Additionally, renewable energy sources can be used to offset the amount of energy needed to be produced by the PEG Power Station. For example, solar PV energy may offset daytime energy production from the PEG Power Station, as well as the existing Solomon Power Station. Wind energy is also being considered for inclusion into the energy strategy of the PEG Program.

2.3.4 Engine Selection

Highly efficient gas-fired reciprocating engines have been selected for the PEG Power Station to enable a lower volume of gas to be consumed. The heat rate of the PEG Power Station

engines (GJ gas consumed per MWh of electricity produced) is approximately 25% better than the gas turbine engines currently utilised at the adjacent Solomon Power Station.

The engines selected for the PEG Power Station have an efficiency comparable to modern combined cycle power stations, however will only use a fraction of the water that a gas turbine fitted with a heat recovery steam generator would consume.

2.3.5 Technology

An advanced Power Management System will be installed to integrate the PEG Power Station, existing Solomon Power Station and additional anticipated renewable sources (eg, solar, wind) and battery storage. This will minimise the generation of GHG emissions by seamlessly and efficiently dispatching electricity across the system, based on complex algorithms that monitor and control the entire generation network.

The Solar PV array planned as part of the PEG Program will install tracking PV which will have better generation (higher penetration) compared to a fixed solar array.

Additionally, circuit breakers that avoid the use of sulphur hexafluoride (SF6) are anticipated to be used at the PEG Power Station.

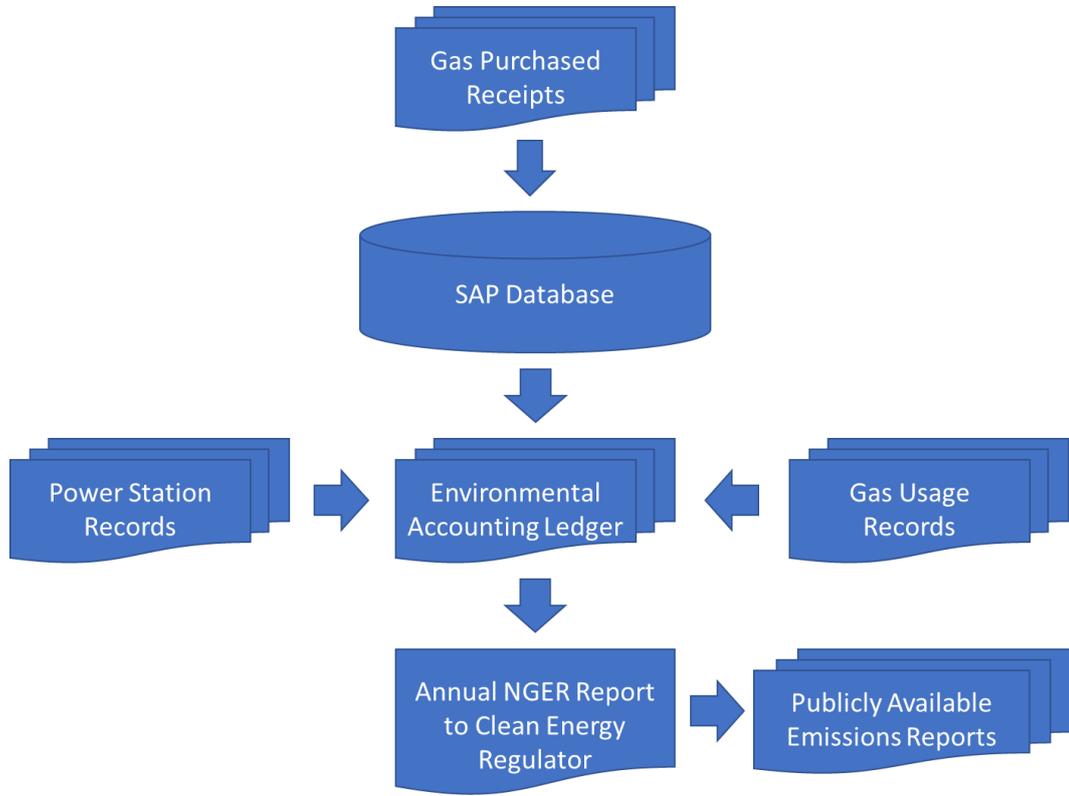
2.4 Monitoring and Public Reporting of Greenhouse Gas Emissions

Fortescue complies with the requirements of the *National Greenhouse and Energy Reporting Act 2007*, by monitoring and reporting annually the greenhouse gas emissions of all facilities under Fortescue's control, in accordance with Figure 1.

When the PEG Power Station exceeds the Scope 1 covered emissions threshold (currently 100,000 tCO₂-e per year), Fortescue will obtain a Benchmark-Emissions Baseline under the Safeguard Mechanism. Fortescue will subsequently monitor and report annually to the Clean Energy Regulator the GHG emissions of the Project against the Benchmark-Emissions Baseline, in accordance with Figure 1.

All results of monitoring and reporting against NGER baselines are made available to the public via access to the Clean Energy Regulator website.

Figure 1 Monitoring and Reporting GHG emissions to the Clean Energy Regulator



2.5 Targets to Reduce Greenhouse Gas Emissions

Fortescue is currently developing organisation-wide greenhouse gas emission targets for interim and long-term emission reductions (interim to 2030, long-term to 2050). This management plan will be updated once GHG emission targets are agreed, expected by the end of calendar year 2020.

3. COMPLIANCE

Fortescue ensures compliance with its legal obligations through first party quality assurance by site environment teams with a focus on effective environmental management through the corporate Environmental Management System (EMS).

Fortescue has adopted a risk-based approach to monitor compliance with its legal obligations. Site environment teams will monitor their compliance with this Plan and the required site-specific management and monitoring programs using the *Self-Verification of High Risk Environmental Legal Obligations Guideline* (100-GU-EN-0030). Where non-conformance issues are identified these will be documented and managed via Fortescue's Business Management System (BMS).

4. REVIEW OF PLAN

This Plan will be reviewed every five years, or as required by an approval condition. Revisions of this Plan will be submitted to the EPA for approval, in accordance with relevant approval conditions.