Baseline Integrity in Climate-Related Disclosures: Influence of Scope 1 Fugitive Methane Quantification in CSG Operations

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Australia’s Climate-related Disclosure Framework

- AASB S2 Climate-related Disclosures applies to annual reporting periods beginning on or after 1 January 2025.
- Applies to entities required to prepare annual financial reports under Chapter 2M of the Corporations Act 2001, subject to applicable reporting thresholds.
- Disclosure requirements cover governance, strategy, risk management, and metrics and targets.
- Disclosures are subject to phased assurance requirements, commencing with limited assurance from Year 2.

From NGER Reporting to Climate-related Disclosures

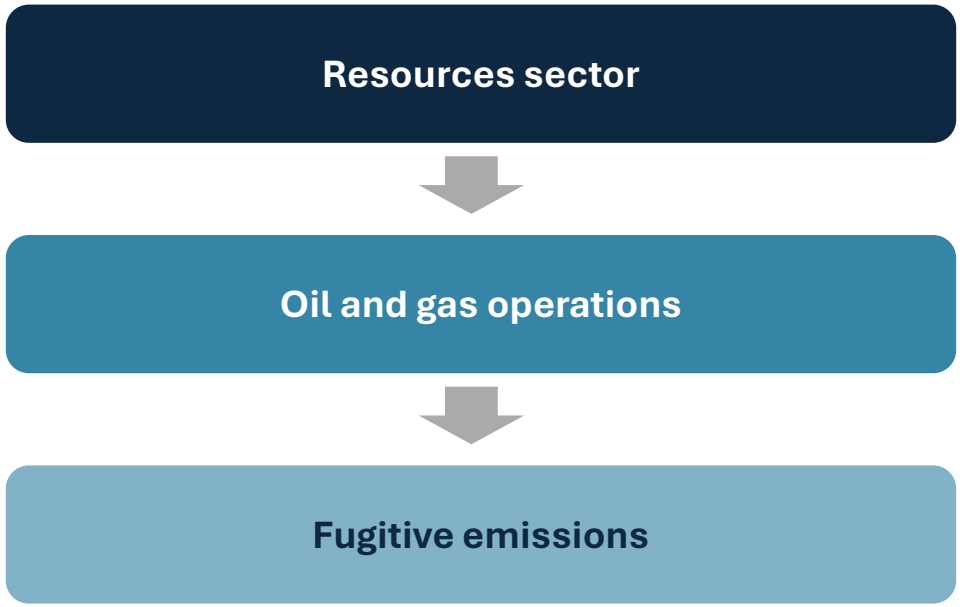
- AASB S2 requires greenhouse gas (GHG) emissions to be measured in accordance with the GHG Protocol, unless an alternate jurisdictional methodology applies.
- Within Australia, jurisdictional relief permits the use of emissions quantified under the National Greenhouse and Energy Reporting (NGER) framework.
- Consequently, Scope 1 GHG emissions reported by Australian oil and gas operators are commonly derived from NGER quantification methodologies.
- Therefore, the quantification method selected under NGER influences reported Scope 1 emissions, baseline integrity, and comparability over time.

Study Objective

- Compare NGER Determination Method 1 and Method 2 estimates of fugitive GHG emissions for a coal seam gas (CSG) production and processing facility.
- Apply both methods to the same facility across two NGER reporting periods: FY 2023-24 and FY 2024-25.
- Assess the influence of quantification methodology on reported Scope 1 emissions, the integrity of climate-related disclosure baselines, and comparability over time.

The facility and reporting periods are held constant. The question this study addresses is what the choice of quantification methodology means for climate-related disclosures.

Materiality of Fugitive Emissions in Australia's Resources Sector



Approximately 22% of Australia's total Scope 1 emissions

Approximately 48% of the resources sector's emissions

Approximately 45% of resources sector Scope 1 emissions

Fugitive emissions from oil and gas operations can arise from leaks, venting and flaring across extraction, production and processing activities.

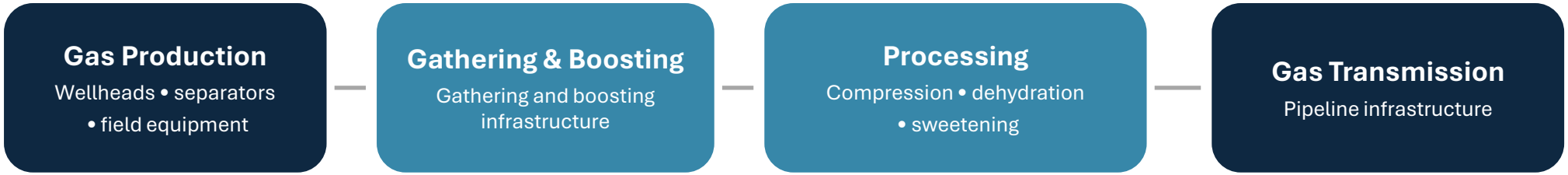
Fugitive emissions represent a material component of Scope 1 emissions within Australia's resources sector.

FY 2023–24. Source: Department of Industry, Science and Resources, Resources Sector Plan (2025).

CSG Operations and Fugitive Emission Sources

CSG is natural gas, predominantly methane, contained within coal seams and produced following depressurisation through dewatering.

CSG operational chain



Fugitive emission sources

Equipment and component leaks • venting • flaring • methane releases associated with produced water handling

Study focus: Method 1 and Method 2 comparison across two reporting periods for selected non-vented/non-flared fugitive emission source categories within the CSG facility's operational chain.

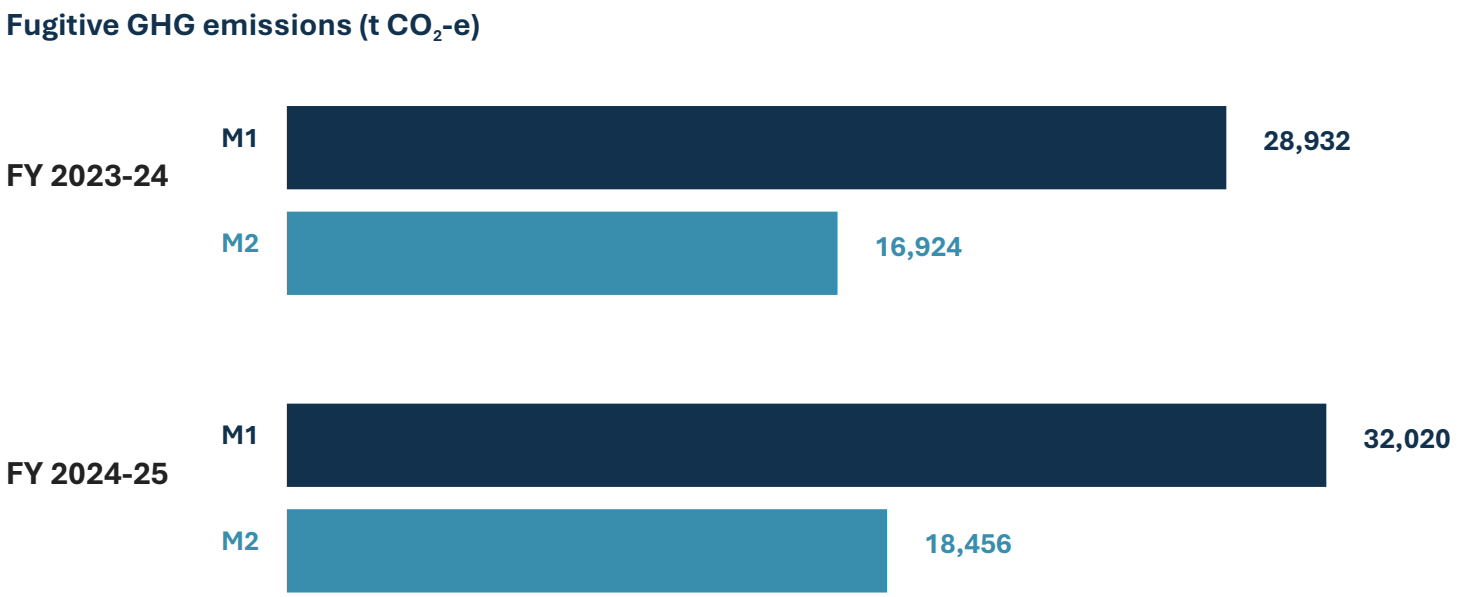
NGER Quantification Methods

- Available methods differ by source category. For the categories assessed in this study, Method 3 is the highest available. Produced water is limited to Method 2.
- Method 1. Default emission factors applied to gas throughput. National average factors determined using AGEIS.
- Method 2. Emission factors are a function of equipment. Equipment counts and operating hours.
- Method 3. Emission factors are a function of components. Component counts and operating hours.
- This study compares Method 1 and Method 2. Method 3 was not applied.

Basis of Estimation

- Estimates were developed under the National Greenhouse and Energy Reporting (Measurement) Determination 2008.
- Compilation 16 applied for FY 2023-24. Compilation 18 applied for FY 2024-25.
- Global warming potentials are as prescribed under the NGER Regulations 2008 and are consistent with AR5. Methane (CH_4) 28. Carbon dioxide (CO_2) 1.
- Emissions are reported in tonnes of carbon dioxide equivalence (t CO_2-e).

Comparative Fugitive Emissions Estimates



42% lower

M2 relative to M1, across both reporting periods.

In the reverse direction, M2 to M1 is an increase of ~72%.

Same facility, same reporting periods. Only the quantification methodology changes.

Comparative Estimates by Source Category

The overall difference is not uniform across the CSG operational chain.

	FY 2023-24		FY 2024-25		Direction
	M1	M2	M1	M2	
Gas production	368	5,785	443	6,138	**M2 higher**
Gathering & boosting	2,864	2,848	2,920	2,827	**Comparable**
Produced water	2,672	291	3,254	355	**M1 higher**
Gas processing	22,180	7,980	24,555	9,136	**M1 higher**
Gas transmission	848	20	848	1	**M1 higher**
Total	**28,932**	**16,924**	**32,020**	**18,456**	

Scope 1 fugitive GHG emissions, t CO_2-e, comparable source categories.

Key finding: neither method is consistently higher across all categories.

Direction depends on how well the prescribed default assumptions represent the facility.

Drivers of Divergence: Gas Production

- Method 2 estimates for gas production substantially exceeded Method 1 across both reporting periods.
- Under Method 2, emissions accumulate across the distributed wellfield inventory. Wellheads, separators, compressors, metering and associated piping.
- Method 1 applies a single throughput-based default factor. It does not distinguish a few high-throughput wells from many low-throughput wells, which is how CSG is produced.
- The fugitive burden associated with large CSG well populations may not be fully represented through volumetric default emission factors alone.

Drivers of Divergence: Gas Processing

- Gas processing showed the inverse relationship and was the dominant source category under both methods. Method 1 estimates were notably higher than Method 2 across both reporting periods.
- Method 1 applies a throughput-based default emission factor calibrated to an assumed industry-average compressor population per unit of gas throughput.
- At this facility, the Method 2 estimate indicates a compressor population and type mix that emit less than the Method 1 default factor implies.

Drivers of Divergence: Remaining Categories

- Gas gathering and boosting.
  - Estimates were broadly consistent across both methods, indicating the Method 1 default assumptions reasonably represented actual equipment at this facility.
- Produced water handling and gas transmission.
  - Both diverged substantially, but from differences in the default emission factors and calculation methodologies rather than equipment population.
- The methods agree where the equipment population matches the Method 1 default assumption. Where they differ, both the direction and the size of the difference reflect the facility.

Transferability of Findings

- The 42% divergence is specific to this facility. Method 2 was built from this facility's own equipment inventory. It is not a correction factor for CSG operations generally.
- What applies more broadly is the relationship. Divergence tracks the gap between the actual equipment population and the assumption inside the Method 1 default emission factor.
- A facility with more compressors and fewer wells could diverge in the opposite direction (i.e. Method 1 below Method 2 for gas processing and above Method 2 for gas production).
- As-such, this assessment demonstrates methodological sensitivity. It does not provide a magnitude for use elsewhere.

Implications for Climate-related Disclosures

- The average annual difference between Method 1 and Method 2 estimates was approximately 12,800 t CO_2-e.
- A base year inventory established under Method 1 produces materially different reduction obligations to one established under Method 2.
- Where the methodology changes between reporting periods, apparent progress against a target may be partially attributable to the method change rather than to operational improvement.
- A 42% reduction can be reported without a single unit of abatement being delivered.
- Given the prevalence of Method 1 across the sector, this sensitivity may extend beyond individual facilities and influence the interpretation of reported industry emissions.

Baseline Integrity from the First Reporting Period

- AASB S2 does not require an entity to set an emissions reduction target. It requires disclosure of targets the entity has set, including regulatory targets where applicable.
- First-year transitional reliefs cover comparative information, Scope 3 emissions, and continued use of a prior measurement method. Target-setting is not among them.
- Group 2 entities entered their first reporting period from 01 July 2026. A first-year reporter may have no emissions reduction target, while its emissions inventory is already being established.
- That inventory may become the base period from which progress against future targets is measured.
- From the second reporting period, comparative information is required for all disclosed amounts, including emissions. Method integrity therefore matters from Year 1. Group 1 entities are entering that period now.

Recommendations and Limitations

Recommendations:

- Disclose and clearly justify material changes in quantification methodology between reporting periods.
- Recalculate prior period inventories and any associated targets on the revised methodology.
- Consider higher order methods where equipment populations differ considerably from industry-average assumptions.

Limitations:

- A single anonymised facility, two reporting periods, selected comparable source categories. The magnitude and direction of divergence observed may not be representative of other facilities.
- Further assessment across additional facilities would test the broader applicability of these findings.

Appendix: Applicable Provisions

- NGER (Measurement) Determination 2008, Compilation 16 for FY 2023-24.
- NGER (Measurement) Determination 2008, Compilation 18 for FY 2024-25.
- s3.73A / s3.73B Method 1 and Method 2, onshore natural gas production (other than emissions vented or flared)
- s3.73K / s3.73L Method 1 and Method 2, natural gas gathering and boosting (other than venting and flaring)
- s3.73NA / s3.73NB Method 1 and Method 2, produced water (other than venting and flaring)
- s3.73Q / s3.73R Method 1 and Method 2, natural gas processing (other than emissions vented or flared)
- s3.76 / s3.77 Method 1 and Method 2, natural gas transmission (other than flaring)

Thank You