Unconventional Gas Facts: Methane leakage and venting

There is a growing body of evidence which suggests that the scale of methane emissions from unconventional gas mining makes it potentially more polluting than coal when burnt for electricity.

During unconventional gas production, methane is released into the atmosphere as a result of leakage from well heads, pipelines and infrastructure, and through deliberate venting and flaring of gas. This methane leakage and venting is often referred to as fugitive emissions.

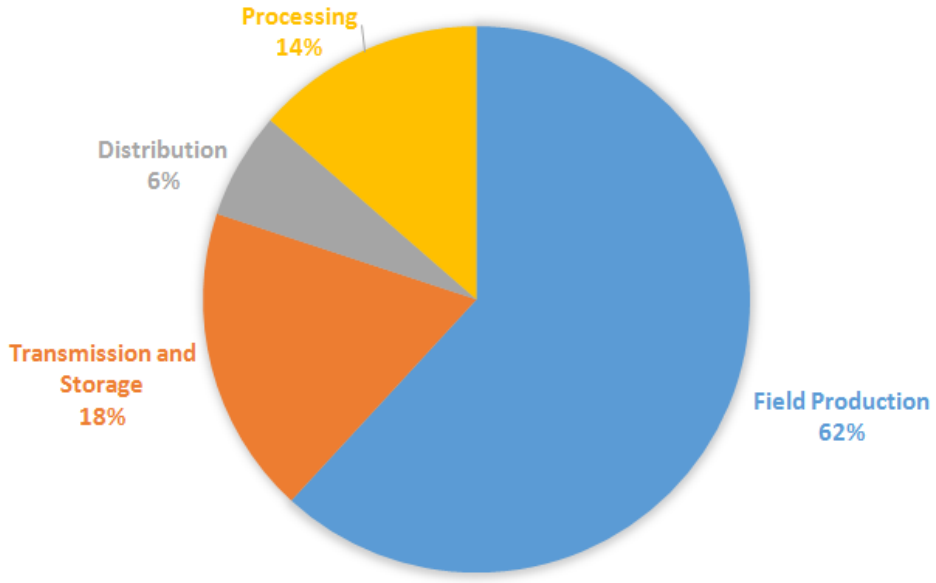
Methane is a potent greenhouse gas- 86 times more powerful than carbon dioxide when its atmospheric warming impacts are considered over a 20-year time period. Therefore, methane leakage rates from gasfields of greater than 3-4% of production mean that gas-fired power will be more polluting than coal-fired power[1]. However, actual measurements of methane leakage from gasfields in the US show a 5-10% leakage rate is common.

Unconventional gas producers claim that gas is a transition fuel, but it is a bridge to nowhere. More gasfields are simply not climate friendly given the amount of methane that is being vented and flared and are not needed given the plunging costs of alternatives in renewable energy and battery storage.

US unconventional gas emissions

A 2016 report[2] by the Melbourne Energy Institute (MEI) reviewing the latest research on methane emissions from unconventional gasfields in the US found that:

1. New measurements have recorded methane emissions of up to 17% of production, with an average of 10% across 5 gas basins- far above the 3% needed to make gas climate neutral against coal.
2. New top down methods of measuring methane emissions (ie from satellites, aircraft) have revealed far greater emissions than have been recorded using 'bottom up' ground-based sampling methods.



Sources of Methane Emissions in the US Natural Gas Sector *(Source: US EPA data Carbon Tax Center website)*

[1] See, for example, Hardisty, P. E., T. S. Clark and R. G. Hynes (2012), "Life cycle greenhouse-gas emissions from electricity generation: A comparative analysis of Australian energy sources." Energies **5**(4): 872-897 & Alvarez RA, Pacala SW, Winebrake JJ, Chameides WL and Hamburg SP (2012) *Greater focus needed on methane leakage from natural gas infrastructure*, Proceedings of the National Academy of Sciences 109(17): 6435–6440.

[2] Lafleur, D., Forcey, T., Saddler, H., and Sandiford. M. (2016) A Review of Current and Future Methane Emissions from Australian Unconventional Oil and Gas Production. Melbourne Energy Institute.

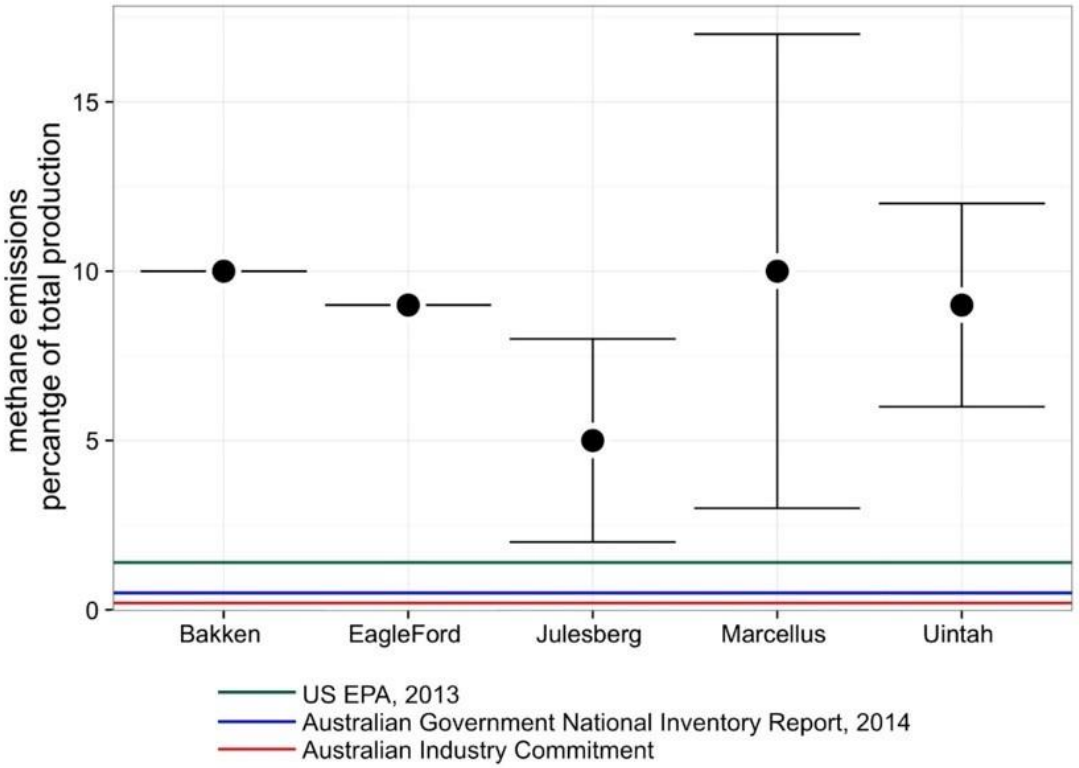
Australia's unconventional gas emissions

Actual measurements of fugitive emissions from unconventional gas are virtually non-existent in Australia. There have been only a view, very limited 'bottom up' studies. Furthermore, there were no baseline measurements prior to the start-up of largescale coal seam gas (CSG) production in Queensland. Therefore, it is expected that there are large methane emissions that are going unreported from Australian gasfields.

In the absence of any rigorous measurements, the Melbourne Energy Institute applied the US measurements to derive estimates of the likely true emissions from CSG gasfields in Australia. It found that, for the current rates of CSG production (1,500 PJ/yr), it is likely that methane emissions from leaks and vents is up to 92 million tonnes of carbon dioxide equivalent each year. That is equivalent to emissions from fuel combustion for Australia's entire transport sector, and would prevent Australia from meeting its Paris climate change targets.

If new shale gasfields are allowed in the Northern Territory or WA, or if the Narrabri CSG project is approved in NSW, these emissions are likely to increase even further.

Measured fugitive emissions at US gas fields compared to Australian industry and government reporting *(Source: MEI)*



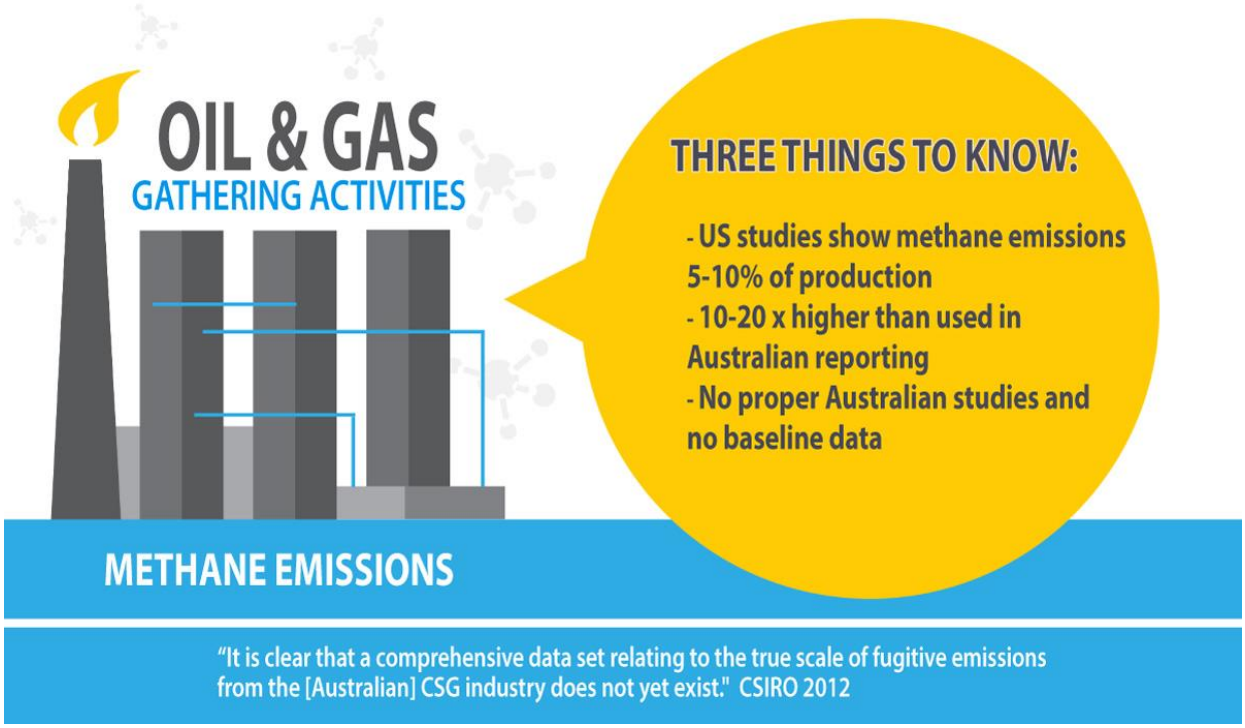
Australian reported emissions

In its most recent greenhouse gas inventory, the Australian Government reported that methane emissions from the oil and gas industry amounted to 0.5% of gas production[3] whilst the Australian gas industry claims[4] that its fugitive emissions amount to only 0.1% of production.

[3] Ibid

[4] Clark, T., R. Hynes, P. Mariotti, A. P. Production and E. Association (2011). Greenhouse gas emissions study of Australian CSG to LNG, Australian Petroleum Production & Exploration Association Limited.

However, the Melbourne Energy Institute notes that methane emissions reporting in Australia relies almost completely on the use of pre-determined 'factors', and is not based on direct measurement. These factors are outdated and lack demonstrated relevance to the Australian unconventional gas industry. Methane leakage rates recorded in the atmosphere at US unconventional gas fields are 10-20 times higher than those the Australian government reports to the United Nations based on 'factors'.



Recorded methane venting in Australia

Special infrared cameras used in the gasfields in Queensland have verified that large amounts of methane is being vented and flared. A 2017 FLIR GF-320 infrared camera survey[5] found:

1. Continuous releases of methane from "high-point vents" on water-gathering pipelines.
2. Intermittent releases of methane from other gas field equipment.
3. Methane bubbling from the Condamine River and Wambo Creek.

Given the very large number of high point vents and other gas field equipment vents which are located throughout Queensland's CSG fields, if the scale of venting detected by the FLIR camera was replicated, it would represent a potentially vast, unmeasured contribution to global warming.

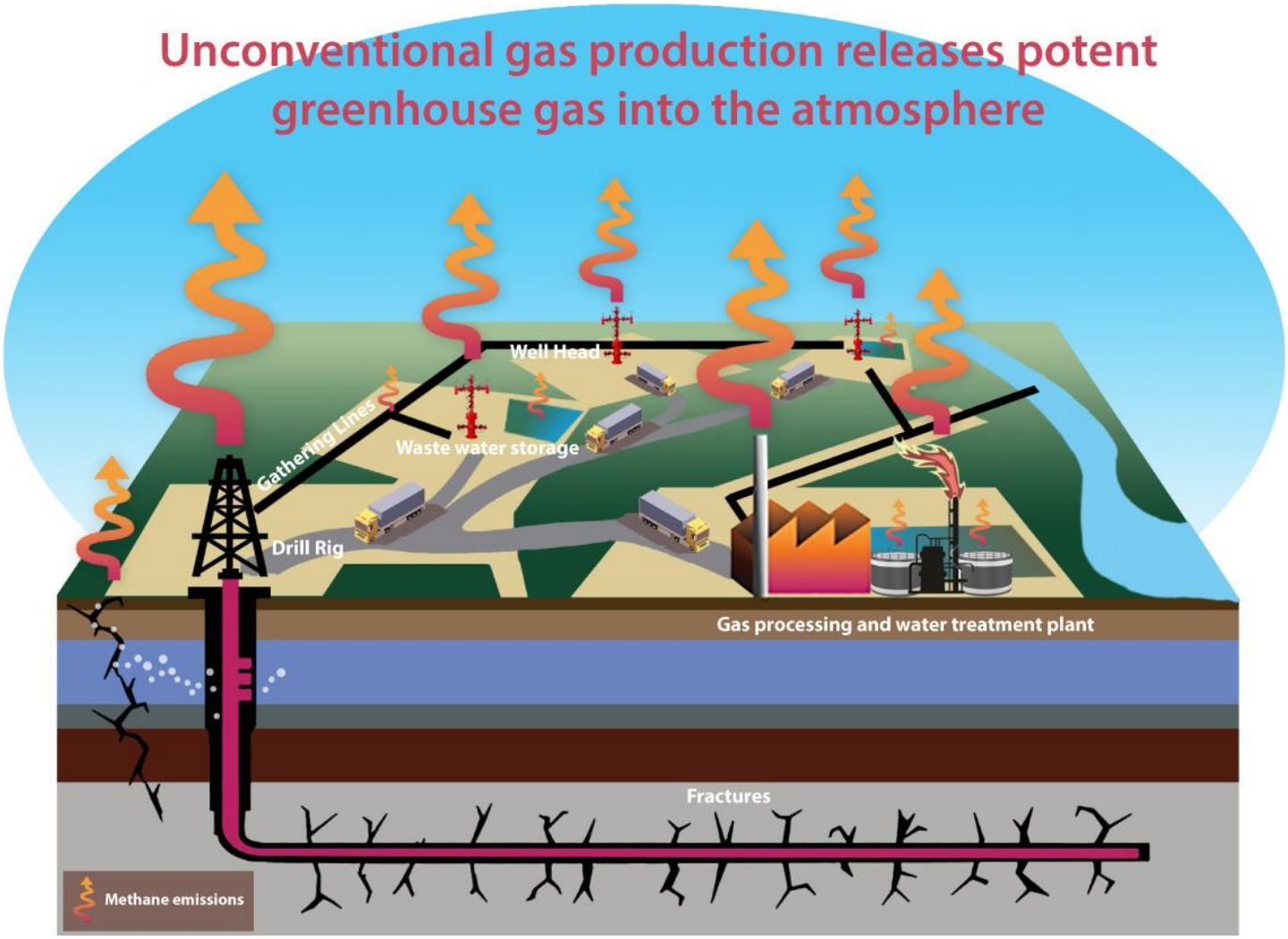
Risk of migratory emissions

Another report[6] by the Melbourne Energy Institute explores the risks of methane gases from a coal seam migrating to the surface after gas production. 'Migratory emissions' are not recognised, measured or reported by government or industry. This report found that such emissions may occur when the pressure in the coal seam is reduced by dewatering for CSG production. Gas is then free to flow to the surface along naturally occurring faults or fractures.

[5] Forcey, T. (2017). *Infrared Video Recording Methane Emissions in the Queensland Coal Seam Gas Fields.* February 2017.

[6] Lafleur, D., Sandiford. M. for MEI (2016), *The risk of migratory methane emissions resulting from the development of coal seam gas in QLD*.

In particular, methane can escape up through existing pathways like water bores, and can result in farm bores becoming inoperable due to excess gas. The report raises concerns that the severe bubbling which has commenced recently in the Condamine River could possibly be the result of these types of migratory emissions.



Sources of methane emissions in gasfield operations

Recommendation for controlling and measuring methane emissions

In light of the serious risks of large-scale fugitive emissions identified by the MEI 2016 report, they recommend that:

- Reported methane-emission measurements should be independently verified by a regulatory body funded by a levy on the industry.
- Methane emissions volumes should be explicitly limited by regulation.
- Independently collected and analysed methane-emissions baseline data should be established.
- Piloted and unpiloted aircraft and air quality monitoring towers should be used for top-down emission investigations.
- Real time, top down methane emissions monitoring should be made publicly available on a website.