

# MEASUREMENT OF LNG FACILITIES' METHANE IMPACT



First independent study provides empirical data on LNG facility related methane emissions and outlines a path to collect further credible data.



**DONOR:**  
Oil and Gas Climate Initiative



**BENEFITTING COUNTRIES OR REGIONS:**  
Worldwide



**SECTOR:**  
Oil & Gas



**Subsector, if applicable:**  
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**STATUS:**  
Published

**TIMELINE:**  
Measurements 2019 to 2021; Latest publication 2023



**IMEO SCIENCE OBJECTIVE:**

→ **Initiate scientific studies in support of data assurance and to characterize regions/sources with high uncertainty or discrepancies in the integrated data.**



Photo: Armandon, National Physics Laboratory



## KEY FINDINGS

Measurements confirmed large leaks and intermittent sources of emissions, demonstrating a continuing need for full site surveying for leak detection, maintenance, and repair processes to minimize emissions. On average methane emission rates were 0.018 per cent and 0.070 per cent of throughput at regasification and liquefaction facilities, respectively. This suggests nearly 0.1 per cent combined loss along the supply chain excluding LNG shipping and pipeline transport to and from the LNG facilities. Calculated emissions factors at liquefaction sites were significantly lower (approximately 1/6th) compared to other emissions factor literature values.

## RATIONALE

At the time this study was initiated, there was significant uncertainty surrounding methane emissions from LNG facilities (liquefaction, regasification, and shipping) with no empirical measurements publicly available. This study surveyed methane emissions from 5 LNG terminals (3 liquefaction – export and 2 regasification – import), representing approximately 6 per cent of global liquefaction and 3.5 per cent of re-gasification at the time, to improve the accuracy of emissions inventories. This was done by dividing measured facilities based on “Functional Elements” to derive accurate emissions factors for areas related to different liquefaction/regasification processes.



## RELATED PUBLICATIONS

- ▶ [Comparative assessment using DIAL technique \(Innocenti et al., 2023\).](#)



## SIGNIFICANCE FOR DECISIONMAKERS

**For Industry:** It is important for operators of LNG facilities to measure and report methane emissions using the right approach to emission quantification. Emissions of some emitting processes depend more on gas throughput than others. Emission factors grounded in measurement data are needed to account for these differences, and this study illustrates how this can be achieved.

**For Policymakers:** The data quality for methane emissions from LNG terminals is still poor because little empirical data exists from very few LNG terminals. Such data will be critically needed for characterizing methane emissions along the supply chain for use in a performance standard or differentiated gas framework. The data collected in this study provide operators with an approach to measure LNG terminal emissions, and the results provide a first glimpse of the possible emission rates even though a much larger sample size is needed to derive wider conclusions.



## STUDY APPROACH/ACTIVITIES

The study team drove an instrumented truck with a differential absorption laser through three liquefaction plants and two regasification plants around the world. The laser scanned all major individual pieces of equipment in each plant and applied wind measurements to quantify emission rates from each detected methane plume. Activity data such as gas throughput and process state data from the collaborating operators was used to convert the measured emission rates into equipment specific emission factors. These can be used for comparison with other plants and for reconciliation with facility-level measurements.



## CATALYZING ACTION

This study was the starting point for two further IMEO studies to characterize LNG terminal methane emissions. One study featured a facility-level comparison with aerial measurements. The Functional Elements / emission factor approach helped compare the truck-based survey in this study with aerial data even though both studies took place at different times. Another study focused on independent aerial measurements covering almost all LNG liquefaction capacity in Australia, thereby significantly reducing the global gap for LNG terminal methane data.

## OTHER SUPPORTERS/STAKEHOLDERS

Principal Investigator: **National Physical Laboratory, UK**

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The UN Environment Programme's International Methane Emissions Observatory (IMEO) exists to provide open, reliable, and actionable data to the individuals with the agency to reduce methane emissions. IMEO does this by integrating and reconciling data across sources, including its global methane science studies. IMEO supports measurement and research studies around the world to close the knowledge gap on methane emissions and provide policy-relevant insights to decisionmakers.